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[Document G.]

BY THE HOUSE OF DELEGATES,

January 18*th*, 1878.

Read, referred to Committee on Printing, and 2000 copies ordered to be printed.

By order,

MILTON Y. KIDD,
Chief Clerk.

SECOND

BIENNIAL REPORT

—OF THE—

State Board of Health

—OF—

MARYLAND.

JANUARY, 1878.

ANNAPOLIS:
GEORGE COLTON, STATE PRINTER,
1878.

MEMBERS

OF THE

STATE BOARD OF HEALTH

OF MARYLAND.

E. LLOYD HOWARD, M. D., ...	Baltimore City.
C. W. CHANCELLOR, M. D., ...	" "
J. ROBERT WARD, M. D., ...	Baltimore County.
CHARLES M. ELLIS, M. D., ...	Cecil County.
GEORGE E. PORTER, M. D., ...	Allegany County.

OFFICERS OF THE BOARD.

E. LLOYD HOWARD, ...	President.
C. W. CHANCELLOR, ...	Secretary.

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COMMONWEALTH OF MARYLAND.

STATE BOARD OF HEALTH,

BALTIMORE, January 1, 1878.

DR. E. LLOYD HOWARD, *President.*

SIR: I have the honor to submit to you, for presentation to his Excellency, the Governor, and the General Assembly of Maryland, the second biennial report of the State Board of Health of Maryland.

With the operations of the Board you are already familiar, and I need only call attention to the valuable contributions which form an essential part and attractive feature of this report. Most of the papers herewith presented are practical treatises on subjects of public interest, and should, for the public good, be freely distributed throughout the State. It is to be regretted that several papers bearing upon local, rather than general sanitary questions, are necessarily omitted.

At my request, and through the courtesy of John T. Morris, Esq., President of the Board of Public School Commissioners of Baltimore, Prof. J. J. Chisolm is now engaged in making a scientific examination into the sanitary condition of the eye-sight of the pupils in the public schools of this city, and will make a full report for the next biennial publication of the State Board of Health. This is a subject of great importance, not only to the present, but to future generations. That eye diseases are alarmingly on the increase, especially in large cities, is a lamentable fact which should force itself upon the attention of the sanitary and educational authorities of the State. Many of the eye troubles, especially near-sightedness, unquestionably originate during school life, and ever afterwards render the eyes of the sufferers more liable to take on destructive diseases. Defective ventilation, imperfect lighting, badly arranged desks, crowded school-rooms, and over zeal on the part of the teachers in forcing the brain at the expense of other organs, are some

of the preventable causes of eye diseases among our school-going population.

Near-sightedness when thus acquired not only annoys the individual sufferer for the rest of life, but may be transmitted to the next generation by "hereditary taint," so that our improved civilization under educational pressure will in time engraft bad eyes upon our whole people. In the public schools of Europe, when an examination had been made of the eye sight of the pupils similar to that now being made by Prof. Chisolm in our own public schools, near-sightedness was found to be progressive with the higher education of advanced schools—being only one per cent. in the primary schools of a rural district, and advancing to even seventy per cent. in colleges demanding the highest grades of mental development.

The paramount importance of strong eye sight, especially to that class of our fellow-citizens who, from the inexorable logic of necessity, must either educate their children in the public schools or permit them to grow up in absolute ignorance, is beyond all question; and hence it behooves the authorities, both State and municipal, not to distribute, with the incalculable blessings of education, an evil of so serious a nature as defective vision. This is a matter which falls legitimately within the domain of State medicine, and I have, therefore, sought the aid of an expert in investigating and pointing out in this particular the defects which may exist in our system of public education, that the eye sight of the child population may in a measure be protected. This important subject, requiring patient and laborious investigation, will be more fully and intelligently presented in the next biennial report of the State Board of Health.

It is a cause for congratulation that no epidemic diseases have existed in this State during the past two years. In the summer of 1876, a highly malignant type of fever prevailed in the eastern section of the city of Baltimore, in a locality where the deposit of every species of filth acted as a secondary agent in multiplying and diffusing the poison of the deadly visitor. It is an unavoidable inference, from the accepted theory of the importation of yellow fever, that

nothing short of the most rigid system of quarantine laws will secure us from the repetition of the evils we have already experienced. Nor can the seaports of the country be effectually guarded against yellow fever while our commerce continues with the tropics, unless the Government of the United States shall, as has been done in Great Britain, institute a general system of quarantine regulations, to be strictly enforced in every commercial city in the Union. Nothing short of a code of health laws, to be alike operative in all seaport towns, will secure us from the evils of pestilence, and experience must ultimately induce the general government to legislate on this subject.

Under existing laws very little can be accomplished by the State Board of Health, to whom is delegated the trust of superintending the public health and comfort, but as their powers have proved insufficient, the Legislature doubtless will assist in the completion of a plan so manifestly directed for the benefit and safety of the people. For what can so strongly demand the attention of the Legislature as the health and strength of the great mass of the people and the security of all—objects to be attained by measures which are alike conducive to private virtue and happiness, to public order and economy, to national wealth and power.

The following is a summary of the expenses of the Board during the two years ending December 31st, 1877.

Balance paid Dr. Howard for expenses of Board	$153 25
Stationery, printing, lithographing, &c	138 91
Postage, telegrams, express, &c	111 35
Advertising	75 70
Books of Reference	9 00
Personal expenses of Board	149 20
Secretary for traveling and other expenses	458 80
Total expended	$1096 21
Amount received from Comptroller	999 27

The above includes all bills which have been audited by the Board, and all expenses which have been incurred up to the 31st of December, 1877, including the distributing of the last biennial report of the Board, and the report of the Secretary on the Public Charities, &c., of the State.

Very respectfully,

CHARLES W. CHANCELLOR, M. D.,
Secretary State Board of Health.

REPORT OF THE STATE BOARD OF HEALTH.

BALTIMORE, January 1st, 1878.

To His Excellency the Governor,
and the Honorable the General Assembly of Maryland:

I have the honor to present the Second Biennial Report of the State Board of Health, with accompanying papers, explaining in detail the work of the Board for the two years ending December 31st, 1877.

Under the Act of 1874, Chapter 200, creating the State Board of Health, it will be seen "the Board have no executive authority whatever, either to abate nuisances, or to act in any other capacity, except as investigators and advisers." The abatement of special nuisances, and such like acts, should form no part of the duties of a State Board of Health. Its work should rather consist in aiding local boards; in collecting statistics of sanitary value: in making investigations into the causes of disease and death; in advising proper measures for the prevention and suppression of epidemics: and in making inspection of jails, almshouses and other public institutions. To carry out these purposes fully and systematically, it is essential that the Board shall have the co-operation of local boards in each town and county in the State; and also, that there shall be enacted a comprehensive and effective system for the collection of vital statistics. Shortly after its organization, the Board realized the need for these agencies, and one of its first efforts was towards securing them. With this view papers were prepared detailing plans by which it was thought most feasible to collect the vital statistics of the State, and on which it was thought local health boards could best be established effectively and economically. These plans were sub-

mitted to the Legislature in the first report of the Board. They were not acted upon, and the work of the Board in the past two years has, in consequence, been greatly impeded and limited.

In the city of Baltimore, the health officer, under the ordinance of 1874, is now successfully collecting the statistics of births and deaths, and, it is confidently anticipated, most interesting and important results will accrue from their classification and study. Outside of Baltimore city, no vital statistics of the least value are being collected. And yet, a correct system for the collection and classification of the records of births, marriages and deaths is the very groundwork of all public hygiene! "Vital registration is the account kept by the State with its population. By it she takes cognizance of every unit of its birth, of its issue and its death. The precise facts thus obtained, bring to light the influences at war against human life, and point unerringly to the means for its protection. By the facts thus procured, and only by these, can the value of life be determined, or the value of applied means for its preservation and prolongation."

It has been estimated that at least *one-third of all the deaths which occur in the State of Maryland, in a year, are from disease that is of a preventable nature!* And yet, with this enormous waste of life, going on from year to year, we not only neglect to take proper steps towards checking it, but we have no means even of correctly estimating the amount of the loss!

At an early period of its history, the Board endeavored to supply, to some extent, the want of local health boards in the State, by enlisting the co-operation and assistance of the more prominent physicians of the several counties and towns, in efforts to improve the sanitary condition, and prevent the spread of epidemics in their respective localities. But, while they were, almost unanimously, earnest in their approval of the objects of the Board, it soon became manifest that their efforts were of too desultory and unorganized a character to accomplish anything of permanent value, and

that only through regularly established official boards can the sanitary condition of towns and rural districts be regulated. In neither of the towns nor counties of Maryland, excepting only Baltimore city, is there in existence a properly organized or efficient health board! Even in the larger cities, as Cumberland, Frederick, Annapolis or Easton, we find no health board whatever, or, merely imperfectly constituted and inefficient "Committees on Health," unworthy the title, and entirely incapable of appreciating the plainest maxims of public hygiene, and which, in the face of threatened or actual epidemic disease, are worse than useless!

In view of these facts, it is specially recommended that some efficient code of Public Health laws be enacted, so that each county, town, and city of the State, may have its local health board to act in co-operation with the State Board of Health.

One of the most important of the duties devolving upon the Board is that of making "special inspections of public hospitals, prisons, asylums and other institutions, when directed by the Governor or the Legislature." In pursuance of this duty, and by direction of the Governor, in a letter under date of February 14th, 1877, in which the Secretary of the Board was ordered to "visit and inspect the prisons, almshouses and public hospitals in the various counties in this State, and report to the Governor at as early a day as practicable their sanitary condition, the treatment of their inmates, and particularly the number of pauper insane who are confined at the expense of the counties, together with a statement of the character of the insanity, and any other facts of interest that may lead to the improvement of their condition," Dr. C. W. Chancellor, Secretary of the Board, during the spring and summer of 1877, made a thorough inspection of all the prisons and almshouses, as well as the reformatories, in the State. The result of Dr. Chancellor's inspection is embraced in his special report, made to the Governor, July, 1877, and printed by order of his Excellency.

Dr. Chancellor's report will be found to contain a very

full and interesting description of each county jail and almshouse in the State, and will show the exact condition in which he found them, and it makes many and important suggestions in regard to their improvement. As was also shown in the report of the Secretary of the Board, made in 1876, the condition of many of the county jails and almshouses was found to be deplorably bad; and the report of Dr. Chancellor has given rise to much discussion and criticism. Indeed, in not a few instances, he has been bitterly assailed, and charged with having greatly exaggerated the evils which he found to exist. This Board is thoroughly satisfied with the accuracy and justice of the report, and feel sure that the attention of the local authorities having been so forcibly directed to these institutions, their condition will be greatly improved. The Board would, however, respectfully suggest the importance of systematic and periodical inspections of the State institutions, and believe great advantages would result from the passage of an act *directing* the secretary to inspect all such institutions *at least once a year*, and clothing that officer, to a limited extent, with power to correct such evils and abuses as may fall under his observation. In several of the States a Superintendent of State Charities has ben appointed, who gives his entire time and attention to the duties of his office, and is paid a salary corresponding with the importance of his position and the amount of work required. In this State the duties of that office should devolve upon the Secretary of the State Board of Health.

The advice and assistance of the Board have been, on several occasions, invoked by physicians and other residents of the counties in matters of local hygiene; and, although not possessed of authority to effectively interfere in such cases, the secretary has visited and inspected the localities, and, through his influence and advice, been enabled to render service to the cause of public health. Usually these services are accomplished through conciliatory counsels, but occasionally it has been necessary to threaten to bring matters of public nuisance to the attention of the grand jury of

the county—the only coercive measures available to the Board. Only when local boards, acting in concert with the State Board, shall have been established, can we hope to act efficiently in suppressing the many public nuisances so common in all our small towns and rural districts.

The attention of the Board has been called, each recurring summer, to the fearful infant mortality in our large cities. It has been estimated that at least one-fourth of all the children born in these cities die before obtaining the age of five years! According to the reports of the Register of Vital Statistics for Baltimore City, *upwards of three hundred children, under five years of age, died in this city in two weeks* of the month of June, 1876. That the dieases—cholera infantum, diphtheria, etc.—mainly responsible for this enormous waste of life, can be greatly checked by improved sanitary conditions has been abundantly demonstrated, and the Secretary of the Board has, on several occasions, appealed, through the daily papers, to the authorities and to the community, in behalf of such improvements in public and private hygiene, as will aid in preventing so fearful a mortality! Two of these articles—pregnant with valuable and practical suggestions—are appended. (See accompanying papers A and B.)

The expenses of the Board for the past two years have been $1,096.21, as is more fully shown in the accompanying detailed statement by the secretary.

Very respectfully,

Your obedient servant,

E. LLOYD HOWARD, M. D.,
President State Board of Health.

(A.)

INFANTILE MORTALITY.

NEEDED SANITARY REFORMS—A DOZEN SOURCES OF DISEASE.

OFFICE OF STATE BOARD OF HEALTH OF MARYLAND,
No. 174 Argyle Avenue,
BALTIMORE, June 29, 1876.

As the duty of the State Board of Health is to "take cognizance of the interests of the health and life of the people generally," and to "make sanitary investigations and inquiries respecting the causes of disease," it may not be amiss to call the attention of our municipal authorities to some measures of much needed sanitary reform.

The people are justly alarmed at the great number of infants which succumb to disease in this city during the heated term. In the past two weeks the Registrar's reports show that upwards of three hundred children under five years of age, have slept their last sleep—an immensely excessive vital loss against the corresponding weeks of 1875. If it were said that Asiatic cholera or yellow fever were accomplishing a work so fell as cholera infantum is now doing in our midst, a panic would be created, and every measure within the public control would be invoked to stay their ravages; but cholera infantum is an *annual visitor*, and hence the astonishing indifference with regard to its extinction or mitigation.

Among the most palpable causes of infantile and other diseases in this community may be enumerated the following twelve sources of atmospheric impurity, the removal of which would surely result in the improvement of the general health and a decrease of the animal mortality.

I. PRIVY VAULTS.

There are upwards of fifty thousand privy vaults in the city of Baltimore, reeking with feculent matter and disseminating their noxious gases broadcast throughout the air we breathe. It is this poisoned atmosphere which so powerfully and fatally impresses the delicate organisms of infants during the hot weather, especially those under two years of age, who have not become habituated to breathing it. Multiplied observation has proved that foul privies are a standing cause of disease in any community where they exist, invariably increasing the amount of sickness and aggravating its danger.

II. WATER CLOSETS.

These are in many instances situated in the very centre or body of dwelling houses, and by ingeniously contrived pipes often discharge their worst gases into the rooms in which we sleep. This evil, of which the citizens of Baltimore are all sensible, can only be effectually guarded against by the establishment of well constructed sewers through which the contents of water closets, etc., may be evacuated.

III. IMPERFECT SEWERAGE.

Among the means to be employed for the purpose of preserving the purity of our atmosphere is the introduction of common sewers, with lateral branches, through which all sewage may be conveyed into the channel of the Patapsco river far below the city. Until these outlets are provided the people of Baltimore must be content to breathe an offensive and unwholesome atmosphere, and be prepared to encounter renewed inroads of disease and increased ravages of death.

IV. STREETS, ALLEYS AND YARDS.

The condition of our streets has not received that attention which the subject demands, either as it regards the character and reputation of the city or the health of its inhabitants.—Filthy streets, alleys and yards are prolific sources of sick-

ness. Here, too, it may be remarked, that the practice of planting shade trees on the sidewalks of streets of residence cannot be too highly commended. It should be recommended, if not made the subject of an ordinance, by the City Council. There is no measure more directly conducive to the general purity of the atmosphere. At the same time it furnishes a defence from the rays of the sun, and constitutes no inconsiderable addition to the beauty of the city.

V. IMPERFECT MARKET SYSTEM.

Under our present imperfect market system, butchers, green grocers and itinerant hucksters are left to supply with unsound meat, withered vegetables and unripe fruit the people who cannot choose but take them. Diarrhœa, dysentery and many other diseases are the results of this nefarious practice.

VI. KITCHEN OFFAL.

The system of removing kitchen refuse, &c., in open carts is not only exceedingly objectionable as it regards cleanliness, but is highly detrimental to the public health. All offal and ashes should be removed in properly covered receptacles.—The uncovered garbage carts, at present used by the Health Department, when filled with refuse matter and driven through the streets, expose, in the aggregate, a vast putrid surface to the sun, inflicting upon the people unhealthy and offensive emanations. These carts, filled with decaying animal and vegetable matter, and driven through all the streets of the city, are contrived to produce disease, just as the gardener's hot bed is contrived to produce his early plants.

VII. FOUL AIR IN CELLARS.

At the commencement of winter, householders usually close all openings to their cellars, and when spring comes, a great many of these are not reopened. There is a want of ventilation and circulation of pure air beneath the floors, and the foul air which often arises and permeates the house injures the health of the occupants and increases the death rate, especially of infants.

VIII. IMPURE WATER.

The use of impure water for domestic purposes, especially that obtained from wells contaminated by filtration from privies, is now regarded by all sanitarians as extremely dangerous, often giving rise to epidemics of typhoid fever, cholera, &c. An examination and analysis of water from different wells in the city, by Prof. E. Lloyd Howard, shows that a majority of the wells are impregnated with the contents of privy vaults, so much so as to be "distinctly perceptible to both taste and smell." Prof. Howard in his able report on the subject says: "I am convinced a large share of sickness and death will be obviated by at once closing every well in the city."

IX. INTRAMURAL BURIALS.

The practice of interring the dead in cemeteries within the city calls for some additional police regulations. No new graves should be permitted in the city, for such is the loose texture of the soil in graveyards, that as soon as decomposition of the body has begun, the gases which are extricated will find egress and mix with the atmosphere, rendering it more or less offensive and impure, and consequently a medium of engendering and spreading diseases.

X. NARROW STREETS AND ALLEYS.

Our City Fathers should be apprised of the close connection which exists between the construction of the city and the health of its inhabitants. Streets that are narrow, as far as opportunities may offer, should be widened, and as few alleys as possible should be permitted. The virulence of the plague in London and Marseilles, as well as its great spread and mortality, were ascribed to the narrow and filthy streets in which it was introduced.

XI. SITUATION AND CONSTRUCTION OF HOUSES.

Another important measure, calculated to prevent the generation and multiplication of diseases among the poor, is attention to the situation and construction of houses in

which they live, so as to secure the benefit of sufficient space and air, embracing the means of enforcing the practice of cleanliness, and limiting the number of occupants.

XII. THE ABSENCE OF FREE BATHING ACCOMMODATIONS.

Public baths are much to be desired. In all ages of the world frequent ablutions of the surface of the body have been considered important auxiliaries to the maintenance of a high degree of health, and to the physical and moral culture of the people; but it is useless to prescribe what so few of the poor of our city now have the power of obtaining, unless they go into a river transformed by mismanagement into a gigantic uncovered sewer. No comment is necessary to show the utility, in a hygienic point of view, of public baths. Their establishment in this city would be greeted with great favor, and would add immeasurably to the public health. "*Medicine cures individuals; hygiene saves masses.*"

Some of the sanitary reforms above referred to have already received the notice of the City Council, though no measures have been adopted to carry them into effect; others cannot be attained without the aid of the State Legislature.

CHAS. W. CHANCELLOR, M. D.,
Secretary State Board of Health.

(B.)

MORTALITY AMONG INFANTS.

PREVENTIVE MEASURES.

To the Mothers of Maryland: The observance of the following rules for the management of infants during the hot season, may afford some protection and security against the ravages of that frightful malady—cholera infantum—which is now prevailing so extensively and fatally in the city of Baltimore:

BATHING AND AIRING.

Bathe child twice a day in tepid water. If it is feeble, sponge it with tepid water or tepid water and vinegar. Let the clothing be light and cool, and so loose that the child may have free use of its limbs. At night bathe or sponge it and put on a slip; in the morning repeat the bathing or sponging, and dress it in clean clothes. Give the child plenty of fresh air. In the cool of the morning and evening send it out to the shady sides of broad streets, to the public squares or parks. Make frequent excursions on the water. It is excessive heat that destroys the lives of young infants.

SLEEP.

The child should sleep by itself. It should be put to bed at regular hours. Without the advice of a physician never give it any *cordials*, *carminatives*, *soothing syrups*, or sleeping drops. If the child frets and does not sleep, it is either hungry or ill. If ill it needs a physician. Never quiet it by candy or cake; they are the common causes of diarrhœa and other troubles.

FOOD.

Breast milk is the best food for infants. Nurse the child once in two or three hours during the day, and as seldom as possible during the night. Avoid giving the breast when over-fatigued or over-heated. If the child must be brought up by hand it should be fed on a milk diet alone—that is, warm milk out of a nursing bottle. Goats' milk is the best, and next to it cows' milk. If the child thrives on this, *no other kind of food should be given while the weather is hot.* The nursing-bottle must be kept perfectly clean; otherwise the milk will turn sour and the child will be made ill.

If the milk is pure and unskimmed it should have one-third part of hot water added to it until the child is three months old; after this age, the proportion of water should be gradually lessened. Each half pint of this food should be sweetened, either with a heaping desertspoonful of sugar of milk or a teaspoonful of crushed sugar. When the heat of the weather is great, the milk may be given quite cold. In very hot weather boil the milk as soon as received, and at once put it away in a cool place—upon ice if it can be afforded. Milk carelessly allowed to stand in a warm room soon spoils and becomes unfit for food. If the milk should disagree, a tablespoonful of lime-water may be added to each bottleful.

Whenever pure milk cannot be got try the condensed milk, which often answers admirably. It may be prepared by adding to a teacupful of boiling water, without sugar, one or two heaping teaspoonsful of the milk, according to the age of the child. Should this disagree, a teaspoonful of arrow root, sago or corn starch to the pint of milk may be cautiously tried. If milk in any shape cannot be digested, try for a few days pure cream, diluted with three-fourths or four-fifths of water—returning to the milk as soon as possible. Weak beef-tea may also be used when the child is six months old and upwards.

CLEANLINESS.

"Cleanliness is next to Godliness." Keep your house sweet and clean, cool and well aired. In very hot weather let the windows be open day and night. Do your cooking in the yard, in a shed or in an upper room. Whitewash the walls, and see that your cellar is clear of all rubbish and filth. Let no slop collect to poison the air. Correct all foul smells by throwing lime or a strong solution of sulphate of iron—copperas—into the sinks and privies. Make every effort yourself and urge your neighbors to keep the gutters of your street and the back yards of your houses clean.

CASES OF EMERGENCY.

If the child is suddenly attacked with vomiting, purging and prostration, and its feet and hands are cold, put it for a few minutes in a hot bath; then carefully wipe it dry with a warm towel and wrap it in a warm blanket. Five drops of brandy in a teaspoonful of water may be given every ten or fifteen minutes; but if the vomiting persists give the brandy in equal parts of milk and lime-water. If the diarrhœa has just begun, or if it is caused by improper food, a teaspoonful of castor oil or of the spiced syrup of rhubarb may be given. The child should be allowed to drink cold water freely.

The above mode of proceeding is recommended until the arrival of a doctor, who should in all cases be sent for at once, and who will select the proper medicines and determine upon the future treatment of the patient.

CHARLES W. CHANCELLOR, M. D.,
Secretary State Board of Health.

ERRATA.

Page 11.—11th line from bottom for upward read *outward*.

Page 21.—2d line from top read *rosy*.

Page 24.—Foot note, 4th line from top omit *between*.

CLEANLINESS.

"Cleanliness is next to Godliness." Keep your house sweet and clean, cool and well aired. In very hot weather let the windows be open day and night. Do your cooking in the yard, in a shed or in an upper room. Whitewash the walls, and see that your cellar is clear of all rubbish and filth. Let no slop collect to poison the air. Correct all foul smells by throwing lime or a strong solution of sulphate of iron—copperas—into the sinks and privies. Make every effort yourself and urge your neighbors to keep the gutters

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CHARLES W. CHANCELLOR, M. D.,
Secretary State Board of Health.

Ventilation.

BY W. C. VAN BIBBER, M. D.

BALTIMORE, MD.

VENTILATION.

A plea for Ventilation is needed in this State, and if cause be shown why it is needed, one point will be gained towards accomplishing the desired result—an attempt at improvement. In order to explain the subject, it will be proper to first show what deficiencies exists; secondly, the nature of the evils which result from a want of proper ventilation, and afterwards to point out some reasonable means for remedying these defects; just as a physician, after he has announced the name of a disease, explains its nature, and then proposes some feasible plan of alleviation or cure.

If I could make the science practical, and display the wealth of the subject to the humblest and most unscientific classes, as well as to the more refined and educated, it would amply repay me to turn aside for a time from the routine of my profession and become a teacher in this work of reform. No man has a better right to know, or to plead for, the necessity of Ventilation, than the practicing physician; and no man feels more deeply than he does when his explanations and suggestions are unnoticed, and, indeed, sometimes almost derided. When the subject is traced back in its literature to a former period, its advance is discovered to be the out-flow from the genius of a few men, most of them physicians and scientific men, who worked solely from the love of truth, and who never asked or received profit for their discoveries.

The subject of Ventilation, although as yet imperfectly understood, is commanding more and more attention amongst

us; and there never was a time better suited than the present to test what is now taught as truth in the matter, and by recording experiments already made, to overcome the imperious authority of private judgment. To accomplish this, there are now a few earnest men scattered over the country, who, with the limited means given to them, have shown great capacity, and are, by occasional publications, evidently increasing the interest in the subject. This is exactly what a large class of "so-called" practical men need; and when this is done, and the appeal further penetrates into the minds of those who hold the main-springs of public opinion, and are in position to facilitate the practical application of principles which need demonstration, then there is no doubt the seed which has been sown will bring forth an abundant harvest. The popular mind is now evidently tossing in uncertainty amongst those principles connected with Ventilation which have been already enunciated, not knowing exactly which to choose, or what to reject.

It will be the object of this paper to deal with the subject practically, and an effort will be made to show how far an interest in it has already been established in this State. The word ventilation is derived from the Latin word "ventilo," and is thus defined: 1, "To fan with wind; 2, to open or expose to the free passage of the air or wind; 3, to cause the air to pass through." The object of its study is to insure for all classes better ventilation, personal health and domestic cleanliness.

In order to make a division of the subject in a way to suit the different classes of population of the State, and also to adapt the different kinds of ventilation which will be proposed to its topography, a few statistical and geographical points have been collected. The District of Columbia has been included in these as a part of the territory properly belonging to the State.

The population of Maryland and the District of Columbia is estimated at present in round numbers at 1,000,000. Of these, 508,000, or nearly 51 per cent., live in cities or towns of over 150 inhabitants; 486,000, or less than 49 per cent.,

live in the country as agriculturists, &c, and about 6,000, or six-tenths of one per cent., live mostly on board ships.*

Geographically the State of Maryland lies between the 37° 53′ and the 40° of North Latitude, and its topography is of a most diversified character. It embraces within its irregular boundaries almost every variety of surface; much of its lands being but little elevated above tide, its middle and northern parts are rolling and hilly, and the mountains in its north-western part rise nearly 3,000 feet above the level of the sea. It contains about 11,000 square miles. Its climate varies with the height of the situation and exposure of the land.

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* The exact figures taken from the last U. S. Census Report (1870) are as follows:

State of Maryland—total population	780,894
District of Columbia	131,700
	912,594
Total population of Maryland living in towns of over 150 inhabitants	342,240
Total population of District of Columbia living in towns	120,583
	462,823
Total population of Maryland living in rural districts	438,654
Total population of District of Columbia living in rural districts	11,117
	449,771

In the table of "selected occupations" (Table XXX) of the Census Report of 1870, there are registered

As "sailors, steamboatmen, watermen, &c., in Maryland	5,968
And in the District of Columbia	265
	6,233

The Board of Health of Washington city estimate the present population at 160,000. The Board of Police of Baltimore city estimate the present population at 305,000. On the basis of this rate of increase for the large cities, the estimate of the total population of Maryland and the District at present in round numbers at 1,000,000 is not thought to be excessive.

The city of Baltimore is the only "observing station" which the U. S. Signal Service has within the State, and, by the kindness of the Chief Signal Officer at Washington, I am informed that "for five years observations, from 1872 to 1876 inclusive, the record stands as follows:

Mean annual Temperature	54° 96°
Average annual movement of the air	51,600 miles.
Prevailing direction of the wind	Northwest.
Maximum Temperature	99°
Minimum Temperature	4°

It is intended by the Board of Health of the State to spread this paper amongst the reading representatives of our agriculturists, citizens and sailors, and therefore an attempt has been made in it to give some practical information particularly adapted to each of these classes. The subject is so comprehensive in all its bearings that a difficulty has been experienced in selecting those points which might seem to be of popular interest; because, since all the points connected with the subject are important, if only a lively, practical interest in Ventilation can be excited in the community, much good may follow from the labors of those who are able to carry on the work. It is well to commence any attempt at advancement by showing in the very beginning the cost of what is offered. To do this concisely, an extract is taken from Mr. W. F. Butler's paper upon "The Ventilation of Buildings." He says: "Before I leave this part of my subject, I will mention one other difficulty in the way of Ventilation, and this by no means a small one—I mean the cost. Although efficient Ventilation will not cost a very large sum per room, it cannot be denied that somewhat will be added to the expense of the house, and this 'somewhat' the speculative builder never will add until he finds that intending tenants and purchasers refuse to take houses which are not properly ventilated."

"As with houses, so with other buildings and works; if we make up our minds to ventilate them, we must also resolve to pay for it.

"I fear that even persons who build houses for their own occupation are but little in advance of the speculative builder,

as far as any recognition of the absolute necessity of efficient Ventilation is concerned. Many hold to such crude devices as open windows and doors, others think a hole of any size or in any part of the wall quite sufficient, while, I believe, a majority—pooh-pooh—the whole question.

"It then becomes the duty of scientific men, and bodies, to educate the public up to the recognition of the fact, that Ventilation is every whit as important as drainage, to individual houses, and that man can no more live in a foul atmosphere than he can while constantly drinking poisonous water.

"Ventilation is a want arising chiefly from modern ways and customs, and is, therefore, a comparatively new branch of science, and we owe our present knowledge of the subject especially to modern researches and discoveries."

During the reign of Queen Elizabeth, it was customary for a host to apologize to his guest if the apartment was not provided with a chimney. Before that period, mankind lived more in the open air than they do now. So greatly do habits, customs and times change. If I had space to relate the experiences of Dr. Desaguliers, who was active in the subject of Ventilation early in the seventeenth century, it would be seen that the work of a reformer was even then harder than now; and it has always been a fact, that any attempt to show fairly what is the true interest of a community at some particular time is met by conflicting personal interests, and other difficulties, the full extent of which will only be known and appreciated in the future.

In this paper, calculations, figures and the scientific nomenclature have been avoided as much as possible; and it was at first intended to adhere strictly to the one subject, Ventilation proper, but warming in winter, cooling in summer, and drainage at all times are so intimately connected with it, that it is impossible, in a popular paper, to treat of the one without alluding to the others also.

OF THE FUNDAMENTAL PRINCIPLES OF NATURAL VENTILATION.

The one general and great principle of all Ventilation is to keep the air in motion: to create a small wind as the word

implies. Without this motion there can be no Ventilation, and in places and situations where the air is held still by artificial obstructions, or where, at a high temperature it remains at rest, there is no real health.

In order to explain the value of motion in the air as a domestic necessity, and further, to show how by its reverse the air may be damaged by both art and nature, some physical and topographical facts may be mentioned.

If even a clean house or room, built moderately air tight, be kept closed for a time, on going into it from out of-doors where the air is in motion, one will immediately find a change in the atmosphere, and perceive that it "smells close." The effect which an absence of motion has upon air may be illustrated by referring to the changes which a similar condition produces upon water and animal food. Rain-water or river-water, if bept at rest, as often happens, in pools or ponds on vacant lots around cities or towns, or in extended marshes along level river courses, becomes stagnant; and flesh, after a time, becomes tainted, when there is no longer a blood-motion through it. All these conditions are detected by the sense of smell, and all of them are injurious to health. In what order or proportions are they injurious? This question is not often asked, and in all fairness, it must be admitted, its true answer depends on a number of circumstances. Yet a few well-known facts in this connection will show the urgent necessity for pure air. The longest period of time upon record in which a man lived without food and water is about fourteen days. If water be given, but no food, life may be sustained longer than this; but deprived of air, human life will be extinguished in three minutes. This serves to show, in one way, and in a prominent manner, I think, the high value of Ventilation. Human life may be continued for a time by bad air, stagnant water and decaying food, but without pure air, good water and wholesome food, life soon loses all its freshness. Most persons make great exertion to obtain good water and sound food, but unfortunately, there is not often the same regard paid to the condition of the air. Is Ventilation then of no importance? Should it not be studied by the statesman and the philosopher, as well as by the physician?

Again, it is a common expression to say "a close day," when there is but little motion in the air. This happens as an atmospheric phenomenon less frequently in hilly and mountainous lands than where the country is level. Topography has much to do with the general motions of the air. So that house-sites, yards, barns and fields, are differently ventilated or affected by the winds—some too little, others too much. This fact is generally known to farmers and countrymen of experience, who find it greatly to their interest to act upon it. But when the principle of motion in the atmosphere at large is more studied, it may account for the production of Malaria in our State in certain situations and during some seasons. This probable effect may be thus explained:

It is well known that Fever and Ague and Remittent Fever are common in the flat lands bordering along the Chesapeake Bay and in the level valleys of fresh water rivers as the Potomac, Patuxent and Susquehanna in our State, and also in similar situations almost everywhere throughout the earth. In such localities, during the months of July, August and September, there are many days when there is no Ventilation in these topographical situations, because there is but little horizontal motion in the atmosphere at large. The range of the thermometer during these months, in this climate, is high during the day, and the water in the marshes and swamps being perfectly still and exposed to the ardent rays of the sun, is heated and gives rise to the formation of copious vapors. It is then, I believe, that the motionless air, resting upon the stagnant and vaporing waters, becomes impregnated with the poison of Malaria. It is then that this poison produces such ill-health amongst the resident population. Some of my reasons for believing this theory to be correct are, that the known factors for the production of this kind of Malaria are valleys and marshes, stagnant water, hot weather, and the plane of atmosphere not extending to a great elevation above tide water. Long experience has proved that some seasons are more sickly than others, and that some situations, even in close proximity to each other, are more affected by Malaria than others. These differences are to be observed sometimes

during wet seasons, and sometimes during protracted droughts; sometimes when there is a rank vegetable growth, and again when this is by no means remarkable. No positive connection between cause and effect has, as yet, been established in this matter. The essential essence of Malaria is admitted to be an unsettled point in science, and from the nature of the elements involved in the production of this poison, it is reasonable to suppose, that whatever this essential essence may be, on account of its subtile nature, the atmosphere would be more likely to be charged with it and retain it, when both air and water are at rest.

Another fundamental principle of natural Ventilation is, that cold air is known to be heavier than warm air. It is by the inequalities of heat distributed through the atmosphere that cosmical Ventilation is effected. This is the cause of the trade winds, and of all winds, both of the upper currents and the lower currents. Within a certain height of atmospheric space cold air obeys gravitation and comes nearest the earth; warm air ascends. This principle lies at the bottom of the subject of Warming and Ventilation, as well as any system of Ventilation for summer or winter estal lished within "definite sections of infinite space," such as dwellings, public buildings and ships.

Another principle of Ventilation largely connected with this part of the subject is the diffusion of gases, or "the theory of agitation," as it is called by some writers. The meaning of this term is, how, and by what laws do different gases mix and commingle with each other in the air? Whilst preparing this paper, I received a letter from a gentleman from which I make the following extract: "I will now concisely and candidly tell you what puzzles me on this subject, so that you may strive to make it clear in your paper I understand how and why warm air ascends But how can carbonic acid gas, which is heavier than air, be made to ascend with it? When I was in Italy I saw a dog go into convulsions when held above what is called the 'grotta-del-Cane,' whilst the spectator could stand above the dog with perfect impunity, because the miasmatic exhalation did not ascend so high. How will you get your heavier gas *up and away?* I know the masters of

Ventilation profess to be able to do it, and I believe they can, but your readers would like to understand *the how?*"

It is not intended in this paper to attempt extended scientific explanations, yet, owing to the great importance of this point, which is referred to in a most prominent manner by all authorities upon Ventilation, it is necessary to state what is believed to be the fact in the case. The weight of air being taken as 1, the weight of carbonic acid gas is 1.52901, showing it to be more than one half heavier than air. But the expansive force of carbonic acid gas, when heated, is greater than that of air. When the breath leaves the nostrils the whole of it ascends, not only because it is warmer and lighter, but because the outer air is colder and heavier. This latter, by its expansive force, pushes the breath up and away—out of reach—before the next respiration. But as the breath cools, and the carbonic acid gas cools with it, this latter separates and falls. If the breathing happens in the open air in the country, the carbonic acid gas falls towards the earth and the shifting winds scatter it through the atmosphere, there to resume its normal proportion. But when the breathing happens in an occupied room, or a crowded hall, the carbonic acid gas will fall towards the floor by the same law, provided there be no upward current in the room to prevent.* Now, how and where, this upward current shall be established, is exactly the point of discussion of the practical men of the present day. With us, Mr. Winans, and Mr. Neilson, the Architect of the Academy of Music, establish the current from below upwards, (see plate, page—,) and carry the damaged air up and directly out of the top of the house. The Architect of the Cook County Hospital of Chicago, and a number of others, draw the air by suction from a point near the floor, after the carbonic acid is supposed to have fallen, and thence carry it away by different contrivances, some more complicated than others. The Bayview Hospital of Baltimore is built with the floor Ventilation

* This is explained in another way and at greater length in the Architect for 1850, and in the Encyclopedia of Useful Arts, Article, Warming and Ventilation. Mr. Robert Briggs, in his paper "On the Relation of Moisture in Air to Health and Comfort," thinks that the injurious effects of carbonic acid gas in crowded rooms has been exaggerated.

and is not a success. It is a matter of importance to establish some law regulating the ventilating current out of a building, because the object in view is to introduce certain definite quantities of pure fresh air into each occupied apartment, in order that it may be mixed with what has already been damaged, so that a healthy and comfortable atmosphere may be maintained. "The theoretical perfection of Ventilation is, to render it impossible for any portion of air to be breathed twice in the same building." How does nature accomplish this under the dome of Heaven? In the open air, the Ventilation is perfect, because the breath, as it leaves the body, has always a higher temperature than the air. In this State, with a mean temperature of 54°, each individual has to warm a gallon of air every minute about 44° F., since the average temperature of the breath is 98°. The least expenditure of power for carrying away the noxious air is to bring in a fresh supply from below, and, hence, the upward current, established by a proper opening at the top of the house, is the most simple, efficient and economical. What damages the air in an occupied dwelling or room? The breathing and cutaneous exhalations of its occupants, the air from heaters in winter, house-dust, the air from neglected cellars, untidy and offensive servants, and the lighting of the apartments at night. These produce organic impurities, increase of moisture, excess of heat, consumption of oxygen and carbonic acid excess. The object of Ventilation is, therefore, to replace the air thus damaged by a cooler and a purer air. This cannot be done in the same way it might be affected with foul and dirty water. Water could be thrown out by measurement; but bad air cannot be thrown out in this way. The conditions are entirely different. To fullfil this principle of Ventilation now under consideration, the purest air which can be obtained must be introduced into the apartment in a proper way, in order that it may be uniformly mixed with the foul air; and this is no easy problem. In the cities and towns, built, governed and kept, like those in our State at present, it is, indeed, a hard problem. The question is becoming more and more complicated with us every year, particulary for summer Ven-

tilation, and attention is most particularly called to this point, viz., where to get the pure air? The yards and premises around the houses, in this State, are not properly attended to, and do not favorably compare with those in the towns of New England. The yards are generally surrounded with decaying board fences, from six to eight feet high, and have been, as a rule, the receptacles of all thrown-away matters of a family for a long time. The exhalation from them are bad, and if such air as that which hovers over such yards be introduced into a house as pure, a mistake may be made, and thus Ventilation will be thwarted of its benefits. A condition of things similar to what is here described is the real origin of yellow-fever, cholera, scarlet-fever, diphtheria and other filth-pestilences which happen in the towns of Maryland and other States. Encamped upon an eminence in the State of Mississippi, I once beheld a most beautiful village situated in a plain upon a high bank of a gracefully sweeping Bayou. The cluster roses and creeping flowers completely covered the roofs, and in the early morning it looked like a fairy city of enchantment. "So fair and yet so foul." Its board-screened, undrained, level and water-soaked yards, were filled with rubbage, dirt, and things offensive, which sheer carelessness had allowed to accumulate, and a filth-pestilence was then rapidly filling its cemetery.

If the citizens of Cumberland, Cambridge, Frederick, Easton, Annapolis, Ellicott city, Belair, Westminster and other towns of our State are wise, they will learn from this example. From their very beginning these towns have suffered both from the way in which the yards were enclosed in the first place, and the slovenly manner in which they have been kept since. Should any of these corporations promptly act upon this idea, and remove the board fences from around their yards, they will not only more surely secure the pure air with which their houses may be ventilated in summer, but, besides this, they will add beauty and elegance, healthfulness and cheerfulness to their homes.

Another principle of natural Ventilation bearing on this subject may be mentioned, viz., that obstructions built upon

the surface of the earth prevent a free circulation of the lower strata of air. Obstructions, in the form of houses, constitute cities, and, of course, must exist wherever a city is built, but in modern cities the streets should be wide and made to suit drainage. Narrow streets and alleys in older cities should be widened and the board fences, which obstruct surface Ventilation, on account of their unsightly appearance together with the filth which they hide, should be substituted by a low iron rail or a curb. Of what use are these board fences now in large cities? Formerly they were built to encircle the Temples of Cloacina, which were most conspicuously erected at one end of their enclosures. These temples are now elevated to a position of one of the household penates in the better classes of houses in large cities, and should be most plentifully supplied with water or dry earth. I know a certain flower-garden, I need not mention in what village or city, which, at the proper season sends forth a most delightful perfume, were it not for a particular building, which stands in one corner, and which, not having any care devoted to it, and being totally destitute of all appliances of deodorization, completely neutralizes the fine aroma of roses and jessamines. At at very trifling cost, and with very little trouble, particularly as the owner of the establishment happens to be a carpenter, all this source of annoyance might be avoided, and both the passers-by and the residents of the house might enjoy fragrance unmingled with fetor. This is only one example out of many. Go into a back room in any of the houses on St. Paul, Courtland or Calvert streets, between Franklin and Baltimore streets, in the city of Baltimore, on a sultry summer day, and then tell me where the pure air needed for Ventilation can be found. This locality is not nearly so bad as many which could be mentioned. Beauty, cleanliness, healthfulness and security would be increased by the removal of the fences around the yards, and it is not an unimportant matter, because the many small yards thus fenced off make an immense aggregate surface. If the curbstone was made equal to a fence by statute law, the open-yard system would be more secure as well as more cleanly and beautiful.

Akin to yard Ventilation is park Ventilation, of which the cities and towns of this State have far too little. In the city of Baltimore parks and open squares have become more numerous during the last few years, and it is certainly a step in the right direction. We still want more, and all the means are at hand for obtaining them. Before leaving this part of the subject, those living in the country must be cautioned about surrounding their houses too thickly by cedars and shade trees. Many of the older improved houses in this State are made damp and unhealthy from this cause. Two instances may be mentioned in illustration from my own personal knowledge. Clifton Park, the country residence of the late Johns Hopkins, was so closed in by a variety of trees and shrubbery that the light breezes of summer could not penetrate to the house. Belleview, the former residence of George A. Reinicker, Esq., was in the same way. The houses were damp, and the atmosphere rendered close and unpleasant. Mr. Thomas Deford has told me of a country house which he knew to be notoriously unhealthy from this cause and neglected drainage combined, and which, since these two causes have been removed, is now a valuable and healthy residence. Nothing could be more beautiful and sensible than the manner in which the elegant oaks are trimmed high from the ground around the Deer Park Hotel in Garrett county. Here the currents of air are not only unimpeded, but the flittering shades give inequalities of heat, which invite the air to constant motion.

A FEW OF THE PRACTICAL DETAILS OF HOUSE VENTILATION.

The Water Board estimates the number of houses in the city of Baltimore at 80,000.

I have not met with any collected statistics showing the whole number in the District of Columbia and State of Maryland; but, by calculating five of the population to each dwelling, will give the dwellings in round numbers for the State and the District at 180,000. It is probable that this es-

timate is short of the actual number. But all houses require ventilation in some way, and in a particular manner according to the purpose for which each house is intended to be used.

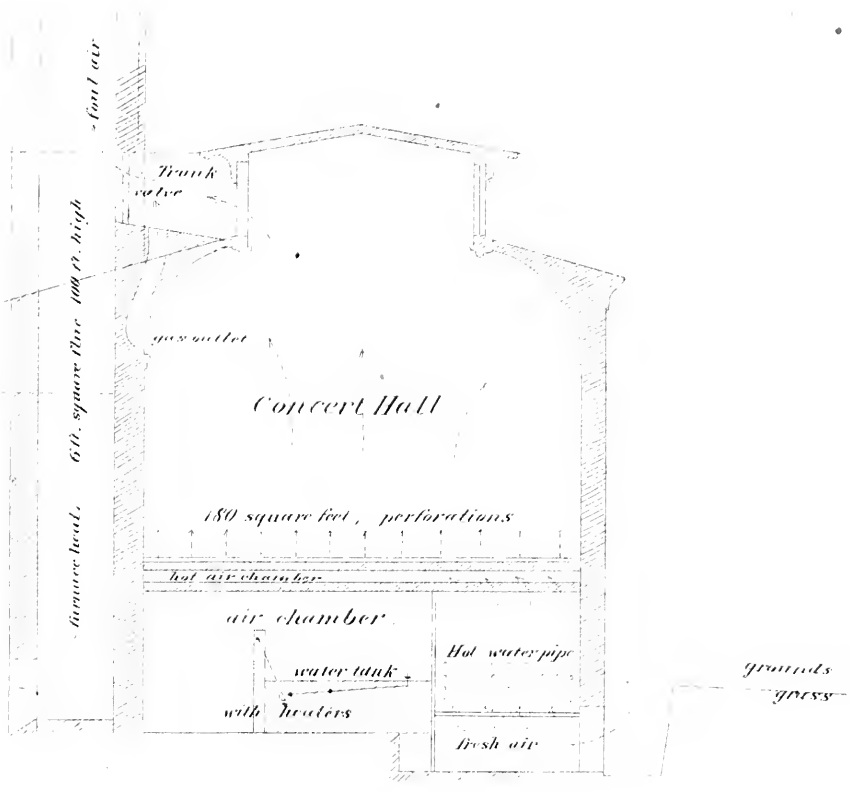
Second to the dwelling, it is the interest of men to ventilate the stabling. "There is no art of greater importance than Ventilation," says Mr. Tomlinson; "for on it depend the health, the comfort and much of the prosperity of man, and of the animals which he domesticates for his use and profit."

Pure air is wanted for House Ventilation, and to obtain it the premises around all houses must be drained and kept in a cleanly condition, whether it be in cities, in towns, or in the country. There is no use in changing even the already damaged air in a house for a worse article; and on this account, like every other exchange, Ventilation requires study and judgment.

The first question, therefore, to be asked is: Where can good air be obtained? But few of the older houses in this State have been built with a view to their ventilation. Within the last few years I have personally been asked an opinion concerning the State House at Annapolis, the Criminal Court room of Baltimore, the First Presbyterian Church and the Madison-avenue Church in the same city, besides other public buildings and a great variety of private dwellings and single rooms within the State. From this circumstance it may be judged that an increasing interest has been manifested in the subject for a long time.

So far as those public buildings which have been mentioned are concerned, they have all been remodeled; and most of the public buildings now under construction are being built with a view to their ventilation, thanks to the study of the subject by competent architects. The earnest gentlemen now engaged in the construction of the Johns Hopkins Hospital are giving the subject the most minute attention. Let no man say the task is not a large and difficult one.

It is generally supposed to be an easy matter to ventilate a dwelling house or a single room; and so it is; but to warm



Partial Section of W. Wyman's Concert Hall.

and ventilate them properly is not an easy matter. And if it is not an easy thing to warm and ventilate a small dwelling, or a moderate sized chamber, how much greater is the difficulty for a large apartment intended to hold hundreds of breathing men and women? All honor to him who shall accomplish such an undertaking in any community. Neither talent or means have been spared to perfect the Ventilation of the two Houses of Congress in Washington, and also many other large public buildings in that city. The results are not yet satisfactory, but the students of the subject are not discouraged.

It has been said, by those who should know, that the best ventilated private house in this country is in Baltimore. It is the residence of Thomas Winans, Esq., with whose permission an outline illustration is here given from a drawing by Mr. Neilson, intending to show the manner of warming and ventilating his concert room. This same principle shown in the illustration is used as a general thing throughout the entire house; but in detail, almost every room has some contrivance especially adapted to its peculiarities. It will be seen by the drawing that the exhaust or ventilating stack for the building is six feet square and one hundred feet high. Those who have practically dealt with the subject will immediately see the large extent of the appliances used from this one measurement alone.

So much for what has been accomplished, and for the interest already excited in the subject of Ventilation amongst a certain class of persons in the State. Now, upon the other hand, it may be even more profitable to inquire, what yet remains to be accomplished? The examples given to illustrate this inquiry are taken from actual personal experiences.

A few nights ago, three physicians were seated in the gallery of a new church in Baltimore, hoping to hear the eloquent instructions of a distinguished pulpit orator. The congregation was large, and those who sat in that gallery nearly two hours had more zeal and endurance, but less prudence.

than the physicians. Some of those who did remain suffered terribly for it afterwards. Can any rational person suppose for a moment that a mephitic atmosphere is at all conducive to a religious feeling? There is an eloquent clergyman in this State, who, when catechising the children in the church on Sunday afternoons, gave orders to lock the doors and let no one out until the whole congregation was dismissed. An attendant upon this service, on one occasion, fainted in the church, because he was prevented from getting out of the building and its vitiated atmosphere; and yet this clergyman is a most pious and noble-hearted man. It only requires a thought, or a suggestion, to turn him into an able advocate of proper Ventilation. Such occurrences as these, in conjunction with knowledge, wealth and present advancement, are certainly inexcusable. That minister, that public officer, or individual owner, who has knowledge, power and means, at command, should deal fairly and justly with those who enter their edifices. Although many persons fully appreciate the value of Ventilation, and avoid these buildings which are imperfectly constructed in this respect, yet it must be confessed a large majority are most negligent about it.

The predominance of people in the lower walks of life, who are unfamiliar with sanitary laws, claim special attention from those who have more knowledge, and particularly from the conservators of health in the interest of the Government. It is, of course, mostly in behalf of these, because they are the most numerous, that this paper is written. The Ventilation of their houses and premises is becoming more and more a modern necessity, and at once appeals to the self-interest of every individual. Dr. H. W. Dean, of Rochester, says, "obviously no one system or plan of Ventilation can be made to meet all cases. Medical men well know that the infectious causes of disease remain in the houses of this class of people, and when developed, extend to other and more salubrious districts; then the evil is recognized and fully appreciated. The great majority of epidemics originate in these localities; the various causes of disease, nursed in damp cellars and apart-

ments, which remain unventilated during the winter, cannot be destroyed by the better Ventilation and warmth of summer."*

Females, children and invalids are, upon an average, during the winter months, from twenty to twenty-two hours of each day in the house, and from five to nine hours in one sleeping apartment; hence the value of House-Ventilation. Notwithstanding this, most of the houses now under construction in the State are not supplied with proper means of Ventilation:

"Ordinance 48, Section 8, 1850, for the city of Baltimore, enacts that no flue or chimney shall be built less than thirteen inches square in the clear, where wood is to be burned. Ordinance 38, Revised Statutes, January 7th, 1869, enacts that flues or chimneys may be built eight inches square in the clear, where hard coal is used." This was one step in house-building economy made in the interest of the speculative builder, and not in the right direction for house-ventilating purposes. The proper art of constructing fire-places and chimneys is fast becoming a lost art, and this is another step in the wrong direction. Those whose business it is to supply the means of warming buildings, and with this some method of Ventilation also, complain that they are not permitted to do all they wish for the comfort of such dwellings in winter on account of expense, although the outlay asked may be comparatively small. This is a point which ought to command more attention than it does, and, in fact, is the gist of the whole of this part of the subject. A good heating and ventilating apparatus for an ordinary dwelling can be obtained now, if one is willing to pay for it. Economy, in the item of good air, is a most false economy. If man cannot live three minutes without air, it is a close inference at least to say that bad air must be injurious.

As the manner of Ventilation differs for the two seasons, it may be proper to make a few practical suggestions concerning some economical means of Ventilation for both summer and winter.

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*Transactions of the Public Health Association, Vol. II, page 329.

HOW SHALL A HOUSE BE VENTILATED IN SUMMER?

One way of ventilating it is by opening the windows and doors in the proper way and at the proper times. It would seem too tediously minute to give further directions here, but the word *proper* has an extended significance in this connection. This kind of Ventilation must be governed by the principles which have already been given, and also by common sense, as well as by comfort and existing circumstances. It implies that the drainage around the house is sufficiently good to admit pure air for the purpose. In order to show practically the value of such Ventilation, permit me to extract again from the letter above quoted: "I will tell you what happened to a neighbor of mine last summer. Mrs. M. had a sick infant about six months old. My daughter and myself went up one day to see if we could do them any good. It was in the hottest part of July. The same room serves the family for kitchen, sitting room, and the baby, as sleeping room. The room was a long, narrow one, extending east and west, with two doors, one north, one south, but not exactly opposite. The cooking-stove was in the north-west corner of the room, the baby-cradle in the north-east. One door they kept always shut, the other partially so, for fear the child might catch cold. The poor little thing was panting and gasping for breath, the mother pale and black under the eyes; the air of the room fœtid and miasmatic. 'What doctor attends that child?' 'Dr. D. Before him we had Dr. L. Then we tried Dr. H. I think we'll discharge him and call in Dr. N.' 'Mrs. M.,' I answered, 'that child is dying from want of fresh air. Did not the physicians employed suggest that remedy?' 'No, sir, not one; they did nothing but give it physic.' Then I took the husband out on the little porch, (for the air inside was making me sick), and told him in plain Anglo-Saxon what I thought of the case and of the restorative effects of fresh air, and why country infants had so much better chance for life in summer than those of a city, &c., &c. He listened with evident attention, and said he would act on it, and a day or two afterwards we walked up again and found both doors

wide open and the child evidently on the mend. The last time I was there the doors were still open, the child was rosey and hearty, the mother had recovered her good complexion, and all the other children looked gay and hearty."

This every-day occurrence so graphically described may be taken as a text for some comments on summer Ventilation. If the air from the open doors had passed over a spot upon which "dish-water" and the general waste-waters of a family had been thrown for a long time, it would not have been healthy air to be brought into the house when the wind set in the proper direction for this purpose.

In malarious districts it is well-known that a piece of woods, or other obstructions to the air coming from a certain place, as a swamp or pond, has an appreciably good effect in preventing malariazation. It is well to have a good weather-vane in such regions, and to watch the direction of the wind, and act accordingly. Close up the house on one side, and keep it open upon others. Questions like these have been suggested: Whether it is better to keep the air in general motion through the house in any given malarial locality, or whether it is better to close it up on one side, or close it up altogether and make fires in the chimney in the evening? "To purify the air by fire," is a common expression, and one found by experience to be of great benefit in practice, when judiciously managed. The beneficial effect of fire may be to dry the air, since moist air is more likely to contain poisons. When Medical Director William Grier, U. S. N., now Surgeon-General of the Navy, was engaged at the new U. S. Marine Hospital at Annapolis, it was suggested to him to study the art of purifying and freeing a house from Malaria by means of Ventilation, fire and atomizers. I believe that the atomizing of medicated vapors as carbolic acid with an instrument made larger, but upon the same principle as Shurtleff & Co., of Boston, make their steam atomizers, would have a good effect upon the air of buildings in malarious districts.

It certainly would be worth while for the inhabitants of malarial regions to most carefully study these and other questions of Ventilation, and then energetically and patiently

apply them to house-keeping during the four months when malarious emanations are most to be dreaded. Unfortunately this aerial poison produces such an apathy and indifference in those deeply affected by it, that such suggestions are seldom heeded by them. The government might very properly assist in organizing a series of experiments having in view the object under consideration.

In summer Ventilation the art of cooling houses should not be neglected. Many contrivances, for this purpose, may be found mentioned in some of the works contained in the Bibliography herewith appended. I believe that a house built double, *i. e.*, with an air wall; or a house within a house, or, to express it in another way; a house with a ventilating shell over it, would, if properly constructed, make a residence cooler, in summer and warmer in winter. The air in the air-wall would be kept in a current from below upwards by the heat of the sun on the roof in the summer and the force of this current might be assisted by bull's eyes of glass or other contrivances of glass properly arranged in the shell. This may be a valuable suggestion for many kinds of houses, both in towns and throughout the country.

Winter Ventilation.—It is impossible to treat of this subject without including that of warming also. A few practical hints will be given, with a hope that they may prove useful. Amidst the great variety of ways, many of them patented, for warming and ventilating dwellings and other houses, most persons are generally at a loss which to choose. The choice in the matter, however, not only affects health and comfort, but, to a certain extent, intellect and morals also, therefore nothing more need be said concerning its importance. Most of the inhabitants of this State live in small rooms. What is the best way of warming and ventilating them? Let us suppose a room 12x14 and 10 feet in height. I would select an open-mouthed stove like a Franklin or Harvard stove, or a grate ten inches from the floor, thirteen inches in length across, eight inches deep at top, six inches at bottom, the bars seven-eighth inch from centre to centre. Soft, or bituminous coal, is the best fuel, and if properly used, a ton and a half

will supply such a stove or grate during an entire season. If hard coal is used the air is too dry for comfort. This open fire both warms and ventilates a room. There are some gas "logs" which may be substituted for them in cities.

On the 5th of September, 1846, John H. B. Latrobe, Esq., of Baltimore, obtained a patent for a stove which is now generally called "The Latrobe Stove," "The Baltimore Heater," or "The Fire-Place Stove," &c. It is a fire-place stove, and the principle of its action in warming the rooms in the upper stories is so generally understood here, that any further description of it is thought unnecessary. There are now many patents connected with it. It is in large demand, and a great majority of the new houses, less than twenty-five feet front, are supplied with them, and almost entirely warmed by them. Of the 180,000 dwellings supposed to be under consideration, it may safely be assumed that the Fire-Place Heater is used for warming at least one-sixth of them, viz., over 30,000. Thus it supplies the comfort of warmth to 150,000 persons, for whose benefit this paper is designed. It is, therefore, worthy of especial remark.*

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*As this stove occupies so conspicuous a place in the warming of houses in this and other States, the points of the original invention, and the alterations which have been made in it since, are here placed side by side:

Latrobe Stove as First Invented.	Latrobe Stove as Now Used.
An ordinary sheet iron radiator, cut to fit the fire-place, leaving about two inches space between the lateral radiators of the stove and the sides of the fire-place—originally used to heat the one room, afterwards employed to heat the rooms above; the flue-board placed in the chimney above the stove; a wooden box for cold air leading from the yard to an opening in the hearth. The air thus warmed was forcibly driven into the room. The lateral radiators were only moderately heated.	Made of cast iron. Intended to heat one or two stories above. The flue-board placed in the second story. Smoke-pipe enters into the chimney above flue-board. A hot air pipe conveys heated air to third story. Air for heating obtained from cellar and room below.

The following letter was written to me by J. H. B. Latrobe, Esq., and gives his own account of his invention:

The Latrobe Stove, invented by John H. B. Latrobe, Baltimore, patented September 5, 1846, extended 1850.

The invention originated in the objection made to having a radiator with a cylindrical fire-pot and lateral drums with return flues on a *parlor* hearth.

This stove is economical, convenient, always under observation, attractive and highly popular. It warms the room in which it is set by radiation, and those above by "convection." The usual place for obtaining the air to be warmed and conveyed to the second or third stories is from the cellar. This is bad air—unless it is brought by a trough from the outer air, as in the original construction—and makes the heat supplied above both unhealthy and unpleasant.

In a lecture delivered before the Peabody Institute upon this subject on the 9th of December, 1869, I described certain addenda for the use of these stoves, and which were intended to obviate the most serious objections to which they are liable.

The principles which should govern the use of hot air furnaces or fire-place heating stoves, are five in number, as follows:

First. The air to be warmed must itself be pure. Secondly. A sufficient quantity must be obtained for the number of persons it is intended to supply. Thirdly. The warmed air must

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The stove was then set back into the fire-place, and the fire-board placed above it in the flue. The great loss of heat suggested the next step, which was to make the drums correspond with the sides of the fire-place, leaving a space of a couple of inches; between which space, the fire-board in front, and an iron flange in the rear, converted into a channel-way into which the external air (introduced through a hole in the hearth communicating with the outside of the building by a wooden trough,) entered and passed over the top of the stove and between it and the fire-board in the chimney, into the room, *moderately* heated by its contact with the sheet iron surfaces of the stove, which was no longer objected to as a piece of furniture, and which art made ornamental, while the appearance of the fire through the mica of the fire-door made it cheerful. The great merit of the stove, in connection with *hygiene*, consisted in the great volume of outside air, moderately heated, thrown through the large opening in the hearth from a correspondingly large trough, into the apartment. The moisture in the air was not dried up, and no evaporating vessel was required. From the space between the top of the stove and the fire board in the chimney, pipes were employed to conduct the heated air into an upper chamber of the house. This was the original Latrobe Stove. Subsequently, in order to render the stove portable, it was made of cast iron in various shapes; and while the principle was not changed, its availability to heat upper chambers was increased by employing more heat in the fire-pot, and deteriorating the invention by depriving it of its original features of *air in large volume and surfaces moderately heated.* In its new shape, it has many names, such as Baltimore Heater, Fire-Place Stove, &c.

be constantly changing; i. e., it must have an escape from the apartment. Fourthly. To restore to the air what is taken from it during the process of warming. Fifthly. To free the air from dust or other organic particles. A few words may be said in explanation upon each of these five principles:

First. The air itself must be pure. What is pure air? It is composed of three gases, viz.: Oxygen, 23; nitrogen, 76; carbonic acid, +10 of 1 volume in every 1,000 volumes, and a variable amount of atmospheric vapor. The manner in which the atmospheric vapor is best explained practically, is this: Let 100 represent the air saturated with atmospheric vapor, when it is more than this it will be precipitated as mist or rain, and then the No. 65 will represent the amount of atmospheric vapor necessary for a healthy or comfortable atmosphere. It is important to bear in mind, however, that the vapor, in the air, although the amount be small, is just as necessary for its comfort-giving property as the oxygen is for its life-giving property.

How can we know when the air is pure? By our reason, the sense of smell and our feelings. Practically these are enough. It can be known by our reason from observing whence it is obtained. For example, would any one go to a cellar to obtain pure, comfortable life-giving air? An inferior order of animal life is justly and properly associated with the air of cellars; such animals as lizards, snakes, snails, turtles and toads. Contrast these with the animals immediately associated with the well-ventilated, dry and sun-lighted air of plains and fields. This immediately suggests beautiful parrots, the agile deer and birds of Paradise. The comparison is perfectly true, and should command most serious attention at present in this State. It is often said, "but *my* cellar is open, and the air in it is pure." It is like the farms in malarious districts. From the evidence of the owner alone no bad cellar can be found. There are many reasons why the air of all cellars must be more or less impure. Would any one voluntarily go into a cellar to live? In the country they are too often filled with decaying apples, cabbage, potatoes or other vegetables, and are seldom cleaned; it is then they poison the

occupants of the house. For these reasons, as well as others, the English Hygienists, and our own also, recommend that the air to be warmed by the furnace or stove should be obtained from fifteen to twenty feet above the earth. This can be done by galvanized iron or tin tubes. A pipe of this kind, eight inches in diameter, will cost about thirty or forty cents per running foot.

When the air is not pure, the feelings soon detect it; impure air causes fullness in the head, giddiness, lassitude and debility.

The second principle is, "The air should be furnished in sufficient quantity for the number of persons it is intended to supply." Each person should have at least 600 cubic feet of space, and then the question arises, what quantity of air must be supplied per head per hour so to dilute the products of respiration and transpiration, or of combustion in lighting an apartment, as to keep the air always pure and fresh? It is a physiological question of the greatest moment to determine how much air each person uses. It is found by calculation and experiment. It may be somewhat curious to know the data and the factors employed in the calculation. When one takes a deep breath, the air passes through the throat and windpipe, and then through about 17,000 bronchial tubes, into the air cells of the lungs. These air cells have been counted and measured — and there are, probably, about 6,000,000 of them. Each one measures about 1-75th of an inch in diameter. These air cells hold altogether 20 cubic inches of air. Each individual breathes 18 times a minute=360 cubic inches=a box 8 inches square. Therefore, each individual damages air to the amount of 16 cubic feet per hour = a box $2\frac{1}{2}$ feet cube. How is the air damaged? Here the calculation takes another turn. It is based upon the carbonic acid in the air. That which you breathe in contains 4-10ths of 1 vol. in 1,000 vols. What is expired contains 4 vols per 1,000 of carbonic acid. The calculation then turns upon the laws of the diffusion of the carbonic acid with the other gases, and it is found that two thousand feet of pure air per head per hour must be supplied for each person.

In schools, court-houses, state-houses, churches, halls, theatres, dwellings, &c., all good architects will now supply this amount, if not prevented by builders or committees. The earliest recollections of many of the natives of this State about fifty years old, must be of an old log school-house, heated by a ten-plate stove, and the scholars and teachers either half asleep or stupid during a large part of school-time. At the present day, thanks to an interest in Ventilation, things are better, but there is still great room for reform. What can be more important than the healthfulness of early education?

The third principle is "that the air, to be changed, must have an outlet from the apartment." It will be known how much air is being delivered into an apartment by finding out how much is escaping from it. The calculation is reduced to a simple form, and it is found out that each person should have eleven square inches of out-flow. It is easy to tell whether any ventiduct is an out-flow or an inlet to air, by the moistened finger, a candle, a feather, or any light fabric. There is an instrument also for this purpose called the anemometer.

It is calculated that an ordinary sized chimney or fire-place, when the draught is established up it, at three miles per hour, will discharge, from the apartment, about twenty-eight thousand feet of air per hour. This being replaced by fresh air would give a sufficient quantity for fourteen persons. Notwithstanding this, many of the new houses now being built for sale in this city are constructed without any fire-places at all, and almost the universal custom is with the ladies to close up the fire-places in the older houses. Nothing can be more injurious to health. I hear it constantly said, "the cold air comes down the fire-places." This is true, owing to the unequal weights of air at different temperatures, and when this is the case, that is, when the fire-place is an inlet of cold air, and not an out-flow of the air already warmed and damaged by use, the only remedy is to establish the draught up the chimney by means of fire, not enough for purposes of assisting in the warmth of the apartment, but simply sufficient to insure a draught up the chimney of about three miles per

hour. This is what is called forced Ventilation by fire, and in this case the out-flow should be near the floor of the apartment. But when the out-flow is not intended to be forced by fire, the out-flow openings should be near the ceiling. In this situation they are more likely to be effective.

The next principle is to restore to the air what was taken from it during the process of warming. It is the atmospheric vapor which was dried from it in the furnace or fire-place heating stove. Air, when too dry, gives great discomfort to most persons, and cracks all wood work. Hence the moisture should be restored to the air before it enters the apartment. The most effectual way to do this is to place the register in a pan of water. This will restore the moisture. It is water applied at the right place, viz., just where the hot air comes into the apartment. An excellent contrivance for this purpose is a patent taken out by a gentleman of Baltimore; it is called the Register Evaporator.

There is an instrument for measuring the moisture in the air called the Hygrometer, but nothing for this purpose can exceed the delicacy of a bouquet of freshly cut flowers, except it be those yet more dear and more highly organized flowers, who droop and wither in badly managed warmed air, and I pity them.

The fifth and last proposition is to free the air from dust and other organic particles; so to speak, to filter or strain the air, and break the solid force of its current. When sitting at a register upon a dry, windy day, I have often felt a puff of air heavily charged with dust blown in my face. This can better be prevented by placing a lady's veil over the inlet than by any other means with which I am acquainted. Fine wire screens have been tried, but do not answer the purpose. I would not insist upon this suggestion so strongly if the lady's veil was not the only fabric that I know of which will answer the purpose intended equally well The nap upon the woof of the veil catches the dust, but allows the air to pass with freedom.

Let me repeat these principles: First. Get pure air to warm. Secondly. Get a sufficient quantity of it. Thirdly.

Restore to it what has been taken away during the process of warming. Fourthly. See that the air is constantly changed, attend to ventilation, and, fifthly, strain from the air its city dust and organic particles.

Without all these things—life can be sustained—for there are few houses in this State where all these principles are strictly attended to. But is it not a pleasure to attempt improvement? To advance with knowledge and avail of its teachings as it progresses? Is it not a pleasure to improve in health and vigor, or, to retain these, as an advance is made, towards the summit of the hill of life? Is it not a pleasure to improve the intellect or the yet more beautiful qualities of the mind? All of these are influenced more or less by the air which is breathed.

In respect to Ventilation there is no difference to be observed in buildings. What has been said for churches and school-houses, applies to dwellings and state-houses as well, and to all inhabited rooms. The architect is as much bound to deliver the 2000 feet of fresh air per head per hour, as the coal-merchant is to deliver good measure of coal to warm the air, or, as the head of a family is to deliver sufficient provisions for each person to sustain life.*

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* Of deterioration of atmosphere, two extreme cases may be cited, each arising from one of the two principal causes usually instrumental in producing that effect, viz.: a lack of sufficient oxygen; and secondly, a great excess of carbonic acid gas. Of the first of these, the most striking, and the one oftenest referred to, is the case of the Black Hole of Calcutta. A detailed account of this may be found in Smollet's continuation of Hume's History of England. Another and still more graphic narration of its horrors may be read in McCauly's article on Lord Clive—both founded on the narrative given by Mr. Holwell, one of the few who escaped. In the whole range of history or fiction nothing is to be met with more unqualifiedly horrible. It almost makes one faint to read it and attempt to conceive it in its awful reality. The size of the apartment is said to have been a cube of only eighteen feet—the number of persons confined 164 only two windows, and those strongly barred with iron, and on that side of the room through which there was no perceptible circulation. Of the whole number of prisoners, only 23 survived, all the rest having died in one night. The details are too harrowing to be dwelt upon, and yet this case has done its good by showing the necessity for Ventilation. It is a

This much has been said concerning the warming and Ventilation of dwellings by the Latrobe stoves, and other air-warming stoves and furnaces, because these are most commonly used in this and other States. This plan of warming and ventilating is adopted by millions throughout the country, and as now used is certainly injurious to health. Even those who sell and place these stoves admit the imperfections of the present plan, and regret they are not allowed to do more on account of expense. The addenda which have been mentioned are not expensive and will amply repay those who will try them. The greatest enemies to any improvement in Ventilation are the ladies; although they and their children are the greatest sufferers when the arrangements are imperfect. Persons who are about building or furnishing houses for their own families generally have some pre-conceived plan of warming and ventilating them. After having said this much, and especially after having examined the questions involved, as well as the appliances used, it would seem proper for me to express an opinion upon the subject. This has already been done for single rooms. In small houses where the hot air furnaces or fire-place heaters are used, the appliances mentioned are indispensable for health and comfort and can be obtained for a small additional expense. In the case of large houses, public or private, I would give preference to indirect radiation of warm water pipes properly placed for regulating the general temperature of the house, and in the case of pri-

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peculiar instance of good brought out from evil. For one life lost then, thousands have been saved since.

The other case—this one illustrating the effect of excess of carbonic acid gas—is the so-called Valley of Poison in Java, first described, I believe, by a Mr. A. Loudon. It is of an oval form, half a mile in circumference, and from 30 to 35 feet in depth. The gas arises to about 18 feet from the bottom. The bottom itself is covered with the skeletons of animals, which have perished by entering into an atmosphere of carbonic acid, which is supposed to originate from volcanic influences.

Between these two extreme cases, each rising from a different cause, numberless intermediate ones might be specified, increasing in intensity from simple headache or slight bodily discomfort up to asphyxia or swooning, yea, even of sudden death.

vate dwellings, for the rooms chiefly used, and at least one upon each floor, I would provide properly appointed open fires. By means of these the house would be ventilated. In the expression of this opinion almost the exact words of Dr. Henry W. Dean, of Rochester, N. Y., have been used.*

Window Ventilation.—The opening of windows "to air" an empty room or building is admissible, but to rely upon window Ventilation for a crowded hall, school-room, church, court-house, or any other apartment, large or small, is now justly regarded with dread and horror. When the window of a hot room is opened, a solid stream of cold air pours in equal to the temperature, force and direction of the wind, and is something frightful to experience. Those exposed to this current are in great danger of contracting disease. Ventilating railroad cars by opening windows is a frequent cause of illness. There are two patents, however, for the Ventilation of a room through a window, which are efficient and agreeable. One is by a gentleman of Baltimore.

Ventilation by Gas.—In England, "The Sun Lighting and Ventilating Company" stand very conspicuous in this admirable improvement. A patent for the same principle has been obtained in this country. It consists in placing the gas lights near the ceiling, and the heat, foul air and products of combustion are conducted through a pipe into a chimney or flue. Examples of this may be seen at the Peabody Institute, and some private dwellings in this city; notably that of Mr. Deford's on Cathedral street. All new houses should be built with this improvement, and it can be applied to any house with a moderate expense and temporary inconvenience.

A large part of the trouble about properly warming and ventilating private dwellings, in my opinion, depends upon the neglect of one principle, viz.: education; and the time is at hand when it is likely this will be remedied. Who is expected to care for the comforts of a house? and who can make it cold or warm, pleasant or unpleasant, at pleasure?

*Reports and Papers of the American Public Health Association, p 329.

Notwithstanding this responsibility, I constantly hear the ladies say that the flues, the chimneys, &c., being out of sight, are complete mysteries to them.

In olden times, when one fire in a house was the rule, and gathered around this domestic circle there was ever an open family discussion as to the proper placing of the fuel to the best advantage, some wishing to make the fire on top and others at the bottom, then this was the only education in house-warming either sex received or required. But now that the ways of warming buildings are more elaborate, the terms of the discussion have become deeper and darker, and the whole problem presents a different aspect, it is time to change the education also.

"Clothing, houses, and fires are the means by which mankind are enabled to inhabit the earth," says Mr Briggs; and, in our State, as well as in all the Northern and Middle States of this country, owing to vicissitudes of climate, the comfortable management of heating and ventilating appliances may be regarded as so many compromises with the weather, demanding skilled arbitrators to nicely adjust the differences.

It is now quite fashionable in large female seminaries to educate the scholars in the art of cooking. It is as necessary to teach a boy how to dress himself and take care of his clothing as it is to educate him in grammar, arithmetic and manners. Females at present are taught the principles of anatomy, physiology and other useful sciences; why should they not be educated in the art of warming and ventilating houses also, which has become one of the essentials of the day, and certainly belongs to their department?

It is the common rule to allow more than twenty tons of coal for a hot-air furnace in an ordinary-sized dwelling, in this State, and with this supply a clumsy servant keeps the house over-heated during moderate weather. With the same appliances, skilled labor can keep the premises comfortable in all weathers with half the amount of coal. The same kind of difference in management extends to the use of the Latrobe or fire-place heating stoves, as well as to steam and water

heaters; and even if automatic valves and other mechanical appliances are supplied, no great change can be expected in these matters of discomfort and waste until the ladies lend their efficient aid to the subject.

Of the Ventilation of Ships or Vessels Claiming Protection under the Government of the State of Maryland.—Probably the best thing which can be done under this head is, simply to call attention to such meagre facts and statistics that have been collected bearing upon this subject.

In the census of the U. S for 1870, the total population of the State of Maryland registered as sailors, steamboat-men, watermen, &c., is 5,968. Dr. J. M. Toner estimates them for the District of Columbia at 250. What hygienic laws, if any, have been passed by either government for their benefit? The oyster-trade is amongst the largest in this State, and hence, numerically and financially considered, the sailors of the State demand the attention of our statesmen. Those engaged in the navigation of the Chesapeake bay are, as a general rule, deeply affected with malaria, and at the same time consumption is common amongst them. They are afflicted with low forms of disease; such as chronic ulcers on the legs; dropsies resulting from diseases of the liver and heart, and cutaneous diseases. Mentally they are ignorant, superstitious and dull.

Their vessels are their homes, and, although it might not be full justice, with the facts at command, to attribute their unadvanced state to the want of Ventilation alone, still it is reasonable to suppose it has something to do with it. Theoretically, no vessels should require hull and cabin Ventilation more than those carrying cargoes of oysters and guano.

Dr. Desiguliers was the first to attempt Ship Ventilation early in 1760. Dr. Hales and Mr. Sutton worked upon this subject about the same time, and the interest aroused in the matter resulted in the trial of a plan which has since been called "Sutton's Method." It consists of the vacuum plan, viz., of drawing the foul air from the interior of vessels by means of suction produced by a fire on deck. This plan and that by wind-sails, are those usually employed in Ventilating

vessels. There are many official reports published showing that either of these plans of Ventilation may be applied to vessels at sea with success and advantage. Before elaborating this subject further, it is necessary to have more statistics and facts concerning the small vessels in the Chesapeake bay than are now known; but as the Comptroller of the State issues licenses to such sailors, thus increasing the revenue into the treasury, it would seem to be a duty of the State to protect this class of citizens hygienically, and advance their interests in this respect, as far as practicable.

Before closing the subject I wish to repeat that the object in writing this paper was more to excite an interest in Ventilation than with an expectation of adding to its science. Every portion of the subject depends upon some principles of philosophy, the practical applications of which are often accomplished by those who have not studied their explanations. "Pure air is the bread of respiration," and a point most prominently insisted upon has been to seek where and how pure air can be obtained. It has been explained why this is a problem for out-of-door life, in a portion of the State, between the months of June and November, and for life within doors during the rest of the year. Whatever effect these explanations may produce, it cannot reasonably be expected that they will have convincing power enough, or that my name will have influence sufficient to have them all carried out immediately. For instance, take one example. When will the board fences be removed from around the yards in our cities and towns? Who will set the example? Who will brave the ridicule, the contrariety of interests and opinions, and it may be the popular anger in such a matter? The older inhabitants are too set in their opinions, and averse to change to advocate it, and the younger ones have neither the means nor the power to act. Yet, with full confidence, it may be asked what one thing would tend to purify the air, or to beautify a city or town more than this? Under the existing circumstances, during the summer months, where can good air be obtained for Ventilation in the cities and towns without some improvement of this kind?

No one acquainted with the peculiar characteristics of our people as connected with their dislike to change of any kind, or a lingering preference for what has been called their cherished institutions, can expect them to act promptly in such a matter. But it is the bounden duty of the State Board of Health, and the members of the profession to which I belong, to ask what gives and perpetuates the peculiar characteristics alluded to? If there be a lack of energy, vim, force, power of action amongst the citizens, what physical causes combined, if any, produce the deficiency? Is it malaria? Is it want of pure air? Deficiency of oxygen; defective Ventilation; too much heat from the sun in the summer and from coal in the winter; the excessive use of stimulants; from too large a proportion of negro population; or is it as yet unknown?

It will be said by some persons who may read this paper that life can be sustained and health kept unimpaired without all of these things which have been recommended. No doubt this is perfectly true in individual cases, but on the other hand, it cannot be denied, that the public health, that is the kind of health which is intended to be provided for by state medicine, is not at a high standard in Maryland. Would it not be a pleasure to see the people of an entire State improve in health and vigor, and to observe its citizens of all classes retain these to the end of a long life? Malaria enlarges the spleen, changes the color and function of the liver, ruins the complexion, blunts the sharpness of the mind, and by causing many other changes deteriorates the entire man. Whatever can be suggested which will prevent these effects must be valuable in this State.

The Government of the United States should surely take care of Washington city, its own home, in the same manner as empires, kingdoms, and other forms of government have cared for their resident capitals. "Like the general, so is the army." When the most learned and eminent men of an intelligent country visit their capital city, they should find it a model provided with the newest improvements of the time, so that knowledge may thus be disseminated by practical illustrations. The inhabitants of the metropolis and capital of

the State of Maryland should fully appreciate their rare opportunities, for, besides being seated around their own Gamaliels of knowledge, they are gathered close under the down-feathers of the general government's wings, and hence should pride themselves upon adding their quota to the nation's advancement.

Finally, I may say, it is highly proper the Government of the State should take some cognizance of the important question of Ventilation, and that it should foster every effort to improve the hygiene of its citizens. It is, therefore, wise that discourses on such topics should be brought before the people through the public documents, and I can have no doubt that the selection of this subject of Ventilation will be productive of much good.

The Government should be a great father to improvements and advancing ideas, striving to guide a numerous family, as near as possible, to the distant realms of perfection and happiness; and what better effort could be made than that which instills an abhorrence for foul and loaded atmospheres, and teaches the necessity and blessing of good, pure air.

A LIST OF THE AUTHORS REFERRED TO ON THIS SUBJECT.

Butler, "Ventilation of Buildings." Burn, "Practical Ventilation." Edwards, "On the Ventilation of Dwelling Houses, &c." Hood, "A Practical Treatise on Warming Buildings, &c." Gouge, "New System of Ventilation, &c." Eckstein, "A Practical Treatise on Chimneys, &c." Leeds, "A Treatise on Ventilation, &c." Perkins, "A Practical Treatise on Gas and Ventilation, &c." Reid, "Illustrations of the Theory and Practice of Ventilation, &c." Ritchie, "A Treatise on Ventilation, Natural and Artificial" Saeltzer, "A Treatise on Acoustics in Connection with Ventilation." Tomlinson, "Warming and Ventilation." Morin, "Etudes sur la Ventilation." Reclet, "Traité de Chaleur." Box, "Practical Treatise on Heat." Treadgold, "Principles of Warming and Ventilation, &c." Hawthorne, "A New Mode of Ventilating, &c." Winans, "Ventilation of Dwellings." Joly, "Traité Pratique de Chauffage, de la Ventilation, etc." Richardson, "Popular Treatise on the Warming and Ventilating of Buildings, &c." Inman, "Report of the Committee of the House of Commons on Ventilation, &c." Briggs, "On the Relation of Moisture in Air to Health and Comfort." Ritche, "Ventilation of Farm Buildings, &c." Rafter, "Mechanics of Ventilation."

Warming and Ventilation,

BY J. CRAWFORD NEILSON, Architect,

BALTIMORE, MD.

Warming and Ventilation.

In recommending a general system for the ventilation of buildings, economy as well as efficiency must be regarded. A cheap method is almost as important as a successful one, since the means of breathing pure air must be placed within the reach of all, of the poor as well as of the rich. If it were not for the cost the constant open fire in the open fire-place would be a safe ventilation to suggest for all rooms with few occupants; such rooms can be well ventilated at some risk of drafts, since it is plain that, if to avoid drafts, the air required for the supply of the chimney should be furnished by some outdoor contrivance, at that point the movement of air in the room would cease and the ventilation with it.

In cases of crowded houses no fire-place ventilation will suffice. It then becomes necessary to move large bodies of air promptly and regularly—the amount required for each person being about one thousand cubic feet per hour. Fifteen hundred people will use in that time one and a half millions of cubic feet. A theatre to accommodate that number of persons would have an auditorium of about the dimensions of eighty feet by sixty-five feet by fifty feet high, or one-quarter of a million of cubic feet of space. It would then be necessary to change its atmosphere six times within the hour, and to pass out the air at the rate of four hundred and fifty cubic feet per second of time. With an aperture of forty-five square feet the speed of the current would be seven miles per hour. This, too, when the air meets with no interruption in its exit.

As a general thing all ventilating cupolas and openings, unless in the shape of large chimneys using much fuel, let in the building nearly or quite as much cold air as the warmed

and used atmosphere they allow to escape. Hence the constant failure in the ventilation of crowded rooms. The sort of tide which becomes established at the supposed outlet impedes the movement required for ventilation and permits the forcing back on the audience of the foul air which ought to have been expelled.

The most perfectly ventilated building in the United States is to be found in Baltimore, and is the house of Mr. Thomas Winans. This gentleman gave much time to numerous experiments, conducted without regard to expense, and with the rare mechanical skill which he possesses. His results show that with a movement of air commencing below, continuing steadily upwards to the top of the building, where it is furnished with a carefully guarded outlet, a most satisfactory ventilation is obtained at small cost. Mr. Winans has demonstrated conclusively that in this manner equal temperatures can be obtained at all levels in the house. The valves by which the outlet is maintained are simple and automatic, but very efficient. Although one feature of them consists of water breaks, containing in a most unprotected way many gallons of water, no interruption to their action by the freezing of the liquid ever occurred. This shows that no outside air passes within.

Mr. Winans' plan puts in practice the theory of ventilation by exhaustion at the top of the building. The heat causes the ascending current, and the place of the lifted air is filled from below under the heavy pressure of the atmosphere. To secure comfort in cold weather, all entering air should be passed over heaters, which would warm moderately without burning it. In the Baltimore Academy of Music, a well known building, the principles that governed Mr. Winans were adopted by me in order to secure the steady movement of a homogeneous atmosphere, which is regarded as the foundation of good acoustics. The results, both in ventilation and sound, have been very satisfactory. The Academy is sometimes warm, but never oppressive, and in acoustical properties it has no equal in the world.

The Maryland Hospital, another very large building de-

signed by me, was prepared for this same system of ventilation. Mr. Winans had not then invented his valves, and means were not on hand, at that time, to defray the cost of getting up and putting into practical use, on a large scale, the silk valves of Judge Dobbin. So, ordinary venetian shutters were fitted into the ventilating towers, using the attics as receivers, with an amount of success, which, although then considered satisfactory, would have to be regarded as failure if compared with the results to be obtained by the adoption of the Winans valves in the towers.

No building which depends for its ventilation upon air-ducts, which discharge into cold garrets and then by venetians or louvres into the air, can be a success. In a very large building, with few persons in many apartments, with wide corridors and long continuous staircases making considerable vertical openings, the atmosphere may be at times less objectionable than in smaller houses; but no building can be ventilated that does not expel at its roof the air vitiated below. For school-houses, theatres, hospitals and churches, this must be vigorously done. Even in the open air, in calm, pleasant weather, it is easy to perceive how soon the air is tainted by a large crowd.

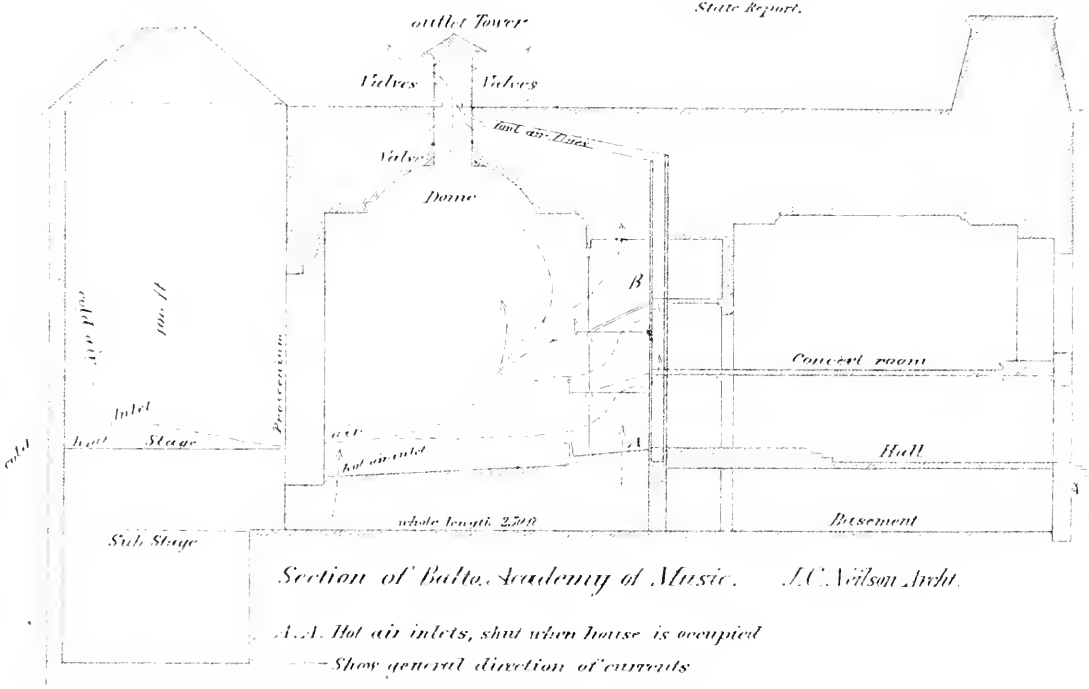
Large chimney flues partially warmed by interior stove-pipes will do but little. They have not aperture enough to pass air, nor is it often introduced into them at the right point near the ceiling. For successful ventilation of these buildings, after we have arranged to introduce at the lower part of the stories air moderately warmed, we must secure an exit at the top of the house large in proportion to its crowded condition. Such an exit must be perfect, that is—it must only pass out air and allow none to re-enter.

It is plain that in smaller rooms, and for few people, the ordinary chimney ventilation, the best thing in common use, is very unreliable. Without a fire on the hearth, the flue becomes a conductor of air into the house, and often the fire-boards put to exclude such drafts are violently and noisily shaken by the wind.

It would everywhere be better to provide an outlet or ex-

haust tower, however small, over the vertical opening of the stairway, and to ventilate the chambers through transoms into the passages, whence the foul air would pass by the stairway opening into the exhaust. Atmospheric pressure below would enforce the exit of the air, and it could be controlled by a plain balance-valve at the base of the tower. The accompanying diagram shows a longitudinal section of the Baltimore Academy of Music. In it, two points A, A, on each side of the floor of the parquet, supply warm air, and are used to keep the empty house up to the proper temperature. They are closed when an audience is admitted, and the supply of air is brought from the stage, passing over steam coils which warm it moderately, so as to render the stage itself comfortable and safe It is often hard to control the temperature of the house on account of the heat of the gas and of the audience itself. The thermometers hung around the upper part of the house in the family circle, at the level marked B, and just within the range of the great chandelier, are, as a rule, three degrees lower than the thermometers of the parquet circle below, showing that in this house no heat is allowed to accumulate in the upper part of the building. As the movement of air was intended to aid in securing acoustical advantages, as well as ventilation, there was impressed on it a horizontal direction by means of large exhaust flues in the three feet thick walls. These flues terminate by trunks in the exhaust tower over the dome. Through this tower there is expelled an average of fifteen thousand cubic feet of air per minute, or nine hundred thousand feet per hour, which suffices for a full audience. This movement of air can easily be increased about one-fifth in volume, but some hesitation is felt in disturbing the original balance of the atmosphere by which such perfect acoustics were obtained.

Dr. C. W. Chancellor's
State Report.



Section of Balto. Academy of Music. J.C. Neilson Archt.

A.A. Hot air inlets, shut when house is occupied

——— Show general direction of currents

House-Air the Cause and Promoter of Disease.

By Prof. FRANK DONALDSON, M. D.

UNIVERSITY OF MARYLAND.

House-Air the Cause and Promoter of Disease.

So much has been written of late years about the necessity of ventilation that we feel we ought to apologize for calling the attention of the public to facts with which all should be familiar. We would not have selected this subject had we not been so frequently struck with the deplorable ignorance, everywhere met with, of the simplest principles of hygiene in connection with atmospheric air, and the consequent violation of its plainest requirements. Contaminations of food or water are more readily recognized, because they offend the taste; but impurities of the air are frequently not appreciated by the senses, and their injurious effects are more gradual and more insidious. *Practically, the community is not alive to the fact that impure air is a poison, and is directly or indirectly the cause of great mortality;* this, too, notwithstanding the fact that the necessity of pure air for the integrity of function of human beings has been recognized for many years. The explanation of this as a scientific proposition was not known until the latter part of the last century (1774), when Priestley discovered oxygen, and Lavoisier discovered the gases of which the air is composed. Lavoisier demonstrated that its oxygen converted the venous into arterial blood. Since that time numerous experimenters and men of science have devoted their time and labor to ascertain the exact relation that the air bears to the body. Popular essays, as well as scientific articles, have been published to show how vital it is to health that it should be always as pure as Nature has given it to us. These have had some beneficial effects, as shown in the construction and arrangement of large public buildings, such as jails, hospitals and almshouses; but in relation to private houses they have done but little. The community generally look upon sanitarians as a professional class, who have hobbies about which they continually write, and think that fresh air and its influence is one of them. Many persons appear to

have literally an abject fear of draughts of cold air, and to lose sight of the less apparent but more dangerous effects of impure air. We are not, however, to be thus discouraged in our efforts to lessen preventible causes of mortality, and we must continue in our efforts to arouse the public to the prevalent suicidal neglect of proper health precautions

For the proper discussion of our subject we propose briefly to explain—

1. What pure air is.
2. Its physiological action.
3. How it becomes vitiated and poisonous in houses.
4. The diseases it produces.

In conclusion, we shall offer some practical suggestions as to the best methods of keeping it pure.

COMPOSITION OF ATMOSPHERIC AIR.

Air is composed of one fifth of oxygen, four-fifths of nitrogen, with an almost infinitesimal proportion of carbonic acid—$\frac{1}{2500}$ of the atmosphere—with very slight traces of ammonia; aqueous vapor in the proportion of $\frac{1}{3}$ to 2 per cent. This last fluctuates greatly, and is mainly influenced by temperature; at a given temperature air cannot contain more than a certain proportion of moisture, for it saturates it; generally the air contains from 50 to 75 per cent. of the amount requisite for complete saturation—the average, according to Prof. Wilson, being 1.46 to 100 parts. If the quantity be not within these limits the air is either unpleasantly dry or moist. The ammonia does not exceed one part in a million parts of air. We have Ozone, or oxygen in an allotropic condition, with, as shown by the spectroscope, everywhere present, chloride of sodium. With this vast ocean of air, fifty-five miles in depth, our little planet is surrounded. It never leaves it as it goes on its course around the sun.

Thus Nature in her bountifulness has furnished us with an inexhaustible supply. Its composition, so far as regards its essential elements, is the same in all parts of the globe and at all elevations within our reach. The outside air frequently contains other aëriform substances, and some of a solid or

fluid nature—such as the gases generated by combustion and similar processes; traces of nitric and ascetic acids, and hydrosulphate of ammonia, and, near the ocean, muriatic acid and iodine; exhalations from the organic kingdom, morbid emanations from men, animals and plants, when suffering from disease and as the result of decomposition after death; carbonaceous matters, infusoria and other microscopic organisms; pollen of plants, spores and germs of some low orders of living beings, and finely subdivided organic matters—dust, invisible malaria, &c. These must be regarded as accidental rather than normal constituents.

The currents of air and the winds, the heat and electricity, keep the atmospheric out-door air in almost ceaseless motion, and these extraneous matters are swept away. The quantity of oxyen is always sensibly diminished in the air of towns, according to Prof. Wilson. The vegetable kingdom, by its absorbtion of carbonic acid and giving off of oxygen, contributes in no small degree to the purity of the external air. Moreover, the air contains within itself the means of its purification. By a process of oxidation it converts all organic substances exposed to it into simpler forms of matter, such as carbonic acid, nitric acid, water, &c. Thanks to Schönbien's grand discovery of Ozone, we now know this agent as the one by which the impurities are oxidised. It is universally admitted to be an indispensable agent, and to be derived from the oxygen of the atmosphere and certain electro-chemical decompositions and to consist of that element freed from its combinations and thrown into a peculiar dynamic and allotropic condition of the nature of polarisation, by means of those currents of electricity at all times flowing silently through the air.

ITS PHYSIOLOGICAL EFFECTS.

Air is the chief factor of life, and its use in breathing is the first and the very last act of our existence as independent beings. We can live a certain period of time without food, but we cannot without air. We must breathe from fifteen to twenty times per minute, and not less than 20,000 times in twenty-four hours.

To understand thoroughly the effects of impurities of the atmosphere we must glance, although hurriedly, at the physiological effects of pure air. The *oxygen* is the element which is efficient in respiration. It is important that it should be understood that the oxygen we breathe enters not only the lungs, but passes, while in the lungs, through the walls of the blood-vessels, and becomes incorporated with the blood, and permeates every tissue and part of the body, and is absolutely necessary for their physiological functions. *Respiration is not confined to the lungs, but extends throughout the body.* In the tissues oxyen is given off, and carbonic acid, the result of the disintegration, and consequently an impure and effete gas, formed in the tissues, passes into the blood and colors it dark. In the lungs there is absorption of oxygen and discharge of carbonic acid. The cause of this *external respiration* is explained by physiologists to result from the differences between the tension of the gases of the blood and the atmosphere, respiration equalizing these tensions. An animal, human or other, placed in a confined space, can consume almost the whole of the oxygen which the air contains, whilst the evolution of carbonic acid is very soon stopped by an equalization of the tensions taking place. *The essence of respiration consists in the interchange of these gases*—the appropriation of oxygen and exhalation of carbonic acid. If this interchange does not take place life becomes extinct. Any impairment of the process, or any impurity of the air, deranges all the functions of the body, such as those of the stomach, nervous system, the brain, the kidneys, &c. This, then, must never be lost sight of, that the lung process is only a *very small part* of respiration, which includes the whole organism. Without the due amount of oxygen the blood does not circulate well in the minutest blood-vessels, and every function is deranged. *We have thus an internal atmosphere of the tissues, as well as an external one.* We pant for breath because our organs and structures everywhere demand oxygen. At each inspiration the volume of oxygen absorbed is five per cent. of the volume of atmosphere, and the exhalation of carbonic acid four per cent.

In the expired air we not only have this amount of carbonic acid, but we have ammonia, and aqueous vapor loaded with organic matter. This last substance can be easily shown by breathing on a sponge, or by allowing the breath to be condensed in a glass vessel; putrefaction, a property characteristic of organic substances, will take place. In the open air the expired air with its impurities ascends and is scattered far and wide; it is purified, and we do not rebreathe it, for we are in literally an ocean of fresh air. The injurious gases become diffused and decomposed; animal emanations are absorbed in vegetation; suspended substances fall to the ground, and organic substances are oxidised, and thus rendered harmless.

Air is not only essential when taken into the organism, but *atmospheric pressure* over every point of the body knits the animal framework firmly together. When we ascend mountain heights, where the atmosphere is lighter, and consequently the pressure diminishes, we suffer with oppressions of breathing, palpitation, and many painful symptoms. Under the normal atmospheric pressure the lungs are filled with air as the walls are expanded. These mechanical effects are essential.

We must also bear in mind the physical influence of the atmospheric air in regulating the *animal temperature*. Radiation of the animal heat is from all points into the external air. If the external air be cooled far below the level of the body, then the radiation is so vigorous that we arrest thereby the vital processes of the body; the grand nutritive acts cannot go on, and we must die. *Thus air is food—the first and the last we partake of.* Its oxygen is carried by those wonderful little missionaries, the red globules, throughout every portion of the body, and we live upon it. Without air, food through the stomach cannot be assimilated. "Starvation is a matter of days without solids, hours without liquids, but of minutes without air." (Parkes.)

HOUSE AIR.

Dr. Parkes' estimate of 3000 cubic feet of air per head each hour is generally believed to be correct. If the space is 1000 cubic feet, the air must be renewed three times every hour.

This, Dr. Parkes tells us, is all that can be borne, and more frequent renewal will make too active air-currents or draughts. House-air is simply air confined within four walls. Wherein does it differ from outside air? The winds and the outside currents do not reach it; and unless we take especial pains to renew it, it becomes vitiated.

Every human being, every pet animal, in a house, consumes the air; and when once thus used, it becomes unfit for further use, because it contains effete substances, the result of the wear and tear of the organism. These when rebreathed enter the lungs, and with the air penetrate into the blood, and thence pass to the structures of the body. The exhaled air contains less oxygen by nearly one-fourth than the inspired column; thus every breath takes away from the really nutritive element of the air. The tissues suffer primarily from deficient supply of oxygen. An adult man exhales on an average .6 cubic feet of carbonic acid per hour. The limit of maximum impurity that can be borne is .7 carbonic acid per 1000 volumes. According to Dr. Carpenter, an adult man gives off 160 grains of carbon per hour. Dr. Parkes gives the average amount of carbonic acid exhaled by an adult in the twenty-four hours as sixteen cubic feet.

The air as it is expired is heated. Hartley states the bodily heat of one man will cause a rise of temperature of 150 cubic feet of air, equal to 173°. Hence the great heating effect of a mass of human beings packed closely together in badly ventilated and ill-lighted buildings.

The expired air contains ammonia in appreciable quantity. The inmates of the famous Black Hole of Calcutta suffered from it. One of the sufferers described the intolerable irritation caused by the inspired air as though the face was held over hartshorn. Of the one hundred and forty-six persons immured, in two hours fifty were dead. The next morning only twenty-three remained alive, and nearly the whole of these suffered from putrid typhus fever, of which many died. We know the irritating influence of ammonia. According to Dr. Richardson, it tends to hold the blood in a state of fluidity. It also interferes with the process of oxidation of organic

matter, so that it becomes an antiseptic, and it rapidly decomposes ozone. The breath and the skin further give off compounds of sulphur and ammonia, sulphide of ammonia, which is directly poisonous. The quantity of watery vapor exhaled is estimated at from 25 to 40 ounces in the 24 hours, and requires an average of 210 cubic feet of air per hour to retain it. This vapor is loaded with organic matter, which is especially deleterious to health. It has a very fœtid smell when it accumulates, and is but slowly oxidized. It is believed (Prof. Wilson) to be molecular, and may be said to hang around a room like clouds of tobacco smoke. Its odor is difficult to get rid of, even after free ventilation. It darkens sulphuric acid and discolorizes solutions of permanganate of potash. When put in pure water it becomes offensive. In sick rooms it is associated with pus-cells and other emanations of disease.

It has been demonstrated that the amount of organic matter in air vitiated by respiration is found to increase as the carbonic acid increases. Dr. Parkes states, and others have confirmed his statement, that it becomes perceptible to the sense of smell when the carbonic acid in an inhabited room amounts to .7 per 1,000 cubic feet of air. Tyndall has shown the amount of this organic dust, which is nothing more nor less than organic poison, that is everywhere present indoors. The philanthropist, John Howard, stated that his clothes became so offensive from prison air that he could not ride in coaches, but had to travel on horseback. The leaves of his memorandum book were so tainted that he had first to spread them open for an hour or two before an open fire before he could use them. Such are the emanations of effete matter which are constantly being given off from organized beings and their excreta. These exhalations, though of a highly putrescent character, especially during disease, and escaping into the atmosphere, under ordinary circumstances are not very cognizable by the senses, except when given off as one or other of the numerous family of volatile alkaline principles. In cold climates like that of Russia a process goes on during the prolonged winter which exhibits very clearly the large amount of organic matter diffused in human exhalations.

The moisture given off by the lungs and skins of the imprisoned inmates of the dwellings of the lower orders in the north of Russia is gradually condensed and frozen on the insides of the windows, where it is often allowed to remain, undergoing a slow process of putrefaction (septic fermentation). On the approach of summer the general thaw causes the melting of this deposit, and thereby setting free the products of decomposition, gives rise to certain most offensive odors, for which the abodes of the Russian peasantry, at the breaking up of the ice, are notorious. (Condy). So charged with this azotised matter is the air which we expire, that if we breathe into a jug of water, putrefactive decomposition is readily perceived. Dr. R. Angus Smith has estimated the quantity as 3 per 1,000. It is to impurities of this nature that we attribute contagion and infection. It settles in houses, and gets into carpets and woolen materials, and in niches amid dust and dirt. Impurity of air is frequently due to impurity of floors, walls and furniture. *The air of a room can never be pure if the room is dirty.* Cleanliness is necessary to our physical health, and, as we have always been taught, is next to Godliness!

Our means of illumination by gas destroys an immense quantity of the air of houses, and leaves injurious products of combustion. One cubic foot of coal-gas destroys the oxygen of eight cubic feet of air in combustion, and produces about two cubic feet of carbonic acid, besides other impurities. A common gas-burner burns about three cubic feet of gas per hour. How long can the air remain pure when there are present several persons, each consuming sixty gallons of it per hour, with gas-jets each destroying as much air as eleven men—660 gallons per hour? If stoves are used, the consumption of air is fearful—not less than 15,000 gallons of air per hour. *It is impossible to breathe, or have fires or lights, without robbing air of its oxygen and loading it with impurities.* When Dalton (as given by Lewes) analysed the air of a room in which during two hours, fifty candles had been burning, and five hundred persons breathing, he found that instead of the proportion of carbonic acid being only two gallons in five thousand of air, it was not less than one gallon in every hundred. Leblanc an-

alysed the atmosphere of three hospitals in Paris, and found that they contained respectively five, ten, and twelve times as much carbonic acid as the air of the streets.

Frequently we have in houses, from the combustion of coal and charcoal, the *oxide of carbon*, which is a deadly gas, with its characteristic blue flame. It renders the blood corpuscles red, and interferes with the absorption of oxygen. If we breathe this gas, even in very small quantities, it is poisonous. No ventilation will prevent us from being poisoned if we are in a room where coke or charcoal fumes are allowed to escape. Dr. Marye and Mr. Lewes both give instances of fatal asphyxia from this cause, although windows were open and air was circulating. Our ordinary gas, escaping into the air of rooms, contaminates; fortunately for us, its smell is unmistakable when it is only one part in a thousand; it becomes very offensive when it is $\frac{1}{750}$ or $\frac{1}{500}$.

Another source of impurity in house-air, is the animal odors proceeding from our kitchens. They float in the atmosphere, and render the air not only disagreeable at the time, but they are deposited in carpets and closets, old clothes, &c., &c. They undergo decomposition, and promote, if they do not actually cause, typhoid fever and other Filth diseases. In Dr. Richardson's model City of Health, he wisely places the kitchens on the uppermost floors. In a sanitary point of view, this is an admirable arrangement. It secures an abundance of light, and the culinary odors ascend and can only annoy the passing birds. With the modern easily-worked hydraulic elevators, this plan can be economically carried out.

Sewer-Gas.—House-air is frequently rendered very pernicious by sewer-air. The gases generated by the decomposition of excremental matter may be enumerated as carbonic acid, nitrogen, sulphuretted hydrogen, light carburetted hydrogen, and ammonium sulphide. The peculiar fœtid smell of sewer-gas is owing to the presence of organic matter, the exact chemical composition of which has not been determined. Like other organic effluvia, it promotes the growth of fungi, renders milk sour, and taints meat. Prof. Brewer, of Yale, remarks: "The sense of smell tells us that there are organic gases and com-

pounds, never yet isolated, of whose composition and properties, other than smell, we are entirely ignorant; indeed, we are ignorant of the composition of most of the smells of putrescent matter."

Ferments.—Of all the poisonous elements in house-air there are none so productive of disease as those now recognized as the *morbific ferments or contagia* in connection with *Filth.* These are not gaseous, but solid in their nature; living organisms, microscopical in their size; indefinitely self-multiplying, and ordinarily developing with fearful rapidity. These ferments are the factors of specific chemical process—the ordinary septic (putrefactive) ferment, always present in putrefactive changes in decaying animal matter. Filth produces fermentative (zymotic) disease. We have what are known as infectious diseases, such as cholera, epidemic diarrhœas, puerperal fever, erysipelas, pyaemia (pus in the blood), septicaemia (putridity of the blood), typhoid fever.

Dr. Klein, Prof. Sanderson of London, and others, have by their experimental pathological researches shown that in the common septic and other ferments there are positive specific disease-producing poisons. These microphytes, apparently of the lowest form of vegetable life, multiply in innumerable swarms in the body and out of the body. Moisture is their normal medium, and the humid air of sewers and drains scatters them far and wide, and thus spreads the fatal seed of infection. Diseases are by these means insidiously disseminated.

The *absence of sunlight in houses* renders the air impure. The sun's rays not only prevent dampness and mustiness, but they purify the atmosphere by destroying organic matter. Organic poisons of infectious diseases, and even the Woorara snake poison, are rendered inert when exposed to sunlight. We will not be so impolite as to say that our fair housekeepers "love darkness rather than light," but they certainly utterly ignore habitually the beneficial, healthful influence of daylight.

Condy makes the statement, that Ozone has never been detected inside inhabited houses, although in many instances,

the external air close to the windows has manifested it abundantly. He considers it the great scavengering principle of Nature, and adds that without it, the atmosphere would ultimately become incapable of sustaining life. It is so opposed to all foul and effete products of living organisms, that its presence in any given locality may be taken as proof of the absence of those impurities which interfere with its fitness for respiration and the maintenance of health. Dr. Ben. W. Richardson states that when the oxygen of air has lost its activity and has become ant-ozonized, it will not sustain life; but if electrical discharges are passed at intervals through the oxygen, it will continue to sustain life.

As we are discussing only house-air, we need not refer to the mechanical impurities in factories and manufactories, which cause so much disease; but in confined air indoors we have foreign particles of woolen and other materials floating in the air and making mischief. We meet with, moreover, arsenical poisoning from green wall-papers, together with the organic paste used in papering. We have the emanations from uncovered night vessels, spittoons, and from filth of various kinds, amounting sometimes to pounds, accumulating in the carpets and the furniture. We inhale musty smells with stagnant air. We breathe the overheated dry atmosphere—all contributing to render the air less sustaining than it ought to be.

All these impurities, with their deleterious influences, accumulate in dwelling-houses unless the air is frequently renewed by efficient ventilation.

DISEASES PRODUCED BY HOUSE-AIR.

We have not exaggerated in speaking of the impurities of house-air. That they may be removed there is no doubt; but that ordinarily they are not, even in the houses of the better classes, is a clearly ascertained fact. The air in inhabited rooms, under the most favorable circumstances, can with difficulty be maintained in as pure a condition as the external air; yet the organic processes of the body are absolutely dependent upon the purity of the atmosphere. Fortunately for us, we do not remain in it always; but those who do, or who are much

indoors, show its effects by their general weakness, their pallor, their bloodless condition, their susceptibility to atmospheric changes, their morning malaise, headaches and dyspepsia. Indoor occupations predispose to all mal-nutritive diseases. Dr. Richardson's statistics showed that of 515 cases of Consumption at his dispensary more than two-thirds were of persons of indoor occupations.

Vitiated air is frequently the direct cause of Consumption, the great scourge of the human race. Is it to be wondered at? When persons are deprived of sunlight, of exercise and of fresh air, their appetites fail; they lose their relish for food, and consequently they are insufficiently nourished. We have shown elsewhere (Amer. Health Ass. Reports, 1875) that pulmonary consumption is essentially a disease of general nutrition, mostly an acquired disease; that the proclivity only is hereditary, but the development is from violations of the simplest laws of health, principally from impure air and absence of sunlight. P. Niemeyer in a recent article takes this view, and shows its correctness by the fact that the deposit first appears in the apices of the lungs—a portion of the organ which is not affected by hereditary pathological processes. MacCormac (on Consumption) tells of a family in which father, mother and six children died of consumption; the seventh son alone survived. He, having quitted the paternal roof and calling, went to sea. The parents and six children lived in narrow quarters, the air of which was quickly vitiated by a large number of persons breathing it; they slept in dusty rooms, with windows closed lest they should take cold. The seventh son quitted the unhealthy locality, had exercise in the open air, became vigorous and healthy and escaped consumption. We frequently meet with just such cases in daily practice. The dust and mucus of the throat and air-tubes collect in the finer air-cells, close them up, and consumption follows.

Dr. Grey (as quoted by Dr. J. R. Black) gives the following table of lung diseases, based upon measurements of the air capacity of rooms occupied by letter-press printers, and the number of compositors in each:

	Number per cent. spitting Blood.	Subject to Catarrh.
104 men having less that 500 cubic feet of air to breathe.	12.50	12.50
115 men having 500 to 600 cubic feet of air to breathe.	4.35	3.48
101 men having more than 600 cubic feet of air to breathe.	3.96	1.98

A demonstration this of the effect of deficient supply of air in development of consumption. Two thousand cubic feet per head per hour is the minimum Dr. Parkes thinks ought to be given. In very many cases that much is not given in twenty-four hours, and continuously for years. How can children grow up otherwise than delicate?

Scrofula, a disease of the glandular system of growing children, is caused and promoted by vitiated indoor house air. If there exists a predisposition to any organic disease, that predisposition is developed into its actual manifestation. If there is general constitutional delicacy, it is increased. Hysteria, in all its hydra-headed forms, is fostered by confinement within doors. What is properly termed biliousness is frequently caused by house-air, and is always made worse by staying indoors. Persons of rheumatoid or gouty proclivities are apt to have attacks when remaining long indoors, which attacks are cured by purer and freer air.

Is it surprising that air that has been breathed, or consumed by gas or fuel, or that which contains impurities or foreign substances, should produce constitutional weakness, and even tissue-disease? It must be borne in mind that through the lungs they enter the circulation, and are carried throughout the organism. Fine dusty particles of charcoal and other foreign matters thus get into the body. Inflammations result, from mal-nutrition, or shocks which disturb the equilibrium of the organic functions. That foul air has these effects we daily see, for persons who spend much time in doors are much more subject to diseases of these kinds than are persons who live outdoors.

Dr. Parkes has given it as his opinion, that allowing .4 volumes as the average amount of carbonic acid per 1000 volumes of air, this standard ought not to exceed .6 per 1000 volumes, because, when this ratio is exceeded, the organic impurities, as a rule, become perceptible to the senses. The amount of carbonic acid in air vitiated by respiration is a tolerably reliable index to the other impurities. Dr. Angus Smith's rule is an admirable one. "Let us keep our rooms so that the air gives no precipitate when a 10½ ounce bottleful is shaken with half an ounce of clear lime-water."

We are frequently met with the reply to any advice offered as to the danger of rebreathing air, that thousands of people live indoors and live for years. This is true; yet it is not the less true that they are poisoned, because there is an adjustment of the organism to the medium by a gradual depression of the functions. The activity is reduced. Bernard's experiments showed that a vigorous, healthy bird would perish instantaneously in air that would sustain the enfeebled bird for an hour. As Lewes remarks with force, "there is a wonderful elasticity in the organism, enabling it to adapt itself to changing conditions; but a frequent depression of functional activity must be injurious and fatal if prolonged." If we take any small animal, a mouse for instance, and force it, after putting it into a close box, to breathe exclusively air exhaled from our lungs it will soon faint, and if we persist in our cruelty it will die. See the pale faces and ill looks of children who sleep with their heads under bed-clothes. Sir James Simpson (quoted by Kingsley) tells of a Christmas frolic, where thirty-six persons danced all night in a small room with low ceiling, keeping the doors and windows shut. The atmosphere of the room was noxious beyond description, and the effect was that seven of the party were soon seized with typhus fever, of which two died. At the Grotto del Cane, near Naples, where Mr. Bergh does not reside, a poor dog is kept, to be stupefied for the amusement of visitors by the carbonic acid gas of the Grotto, and brought to life again by being dragged into the fresh air.

Our houses are not equal to the famous Black Hole of Cal-

cutta, but it is only in degree that they differ. We have shown how they are contaminated by injurious gases. It is the *organic matters* that we exhale, and the fermentive contagia which are produced to such an extent everywhere, which poison our house-atmospheres. Our house-sewerage is so defective, that insidiously we inhale poisons that propagate, even if they do not produce, typhoid fever, diphtheria, scarlet fever, &c.—filth diseases. *Sewers, it is undeniable, often become the channels through which contagious diseases are propagated.* The air from them, laden with specific, definite poison, easily penetrates, from its greater tension, into dwelling houses, from imperfectly ventilated drains and imperfect traps. During the summer months, when the high temperature outside forces us to open our windows, these diseases are comparatively rare; but as soon as the first autumnal cool weather comes, we close our windows and put down our carpets; then these diseases reappear and spread. It would appear as if the germs, the ferments and organic dust lie dormant in the house-air during the Summer, and in the Fall spring into activity and spread by propagation in stagnant, foul air.

Last year we attended in consultation, in a large house, an adult with fatal diphtheria. One of the inmates left and stayed elsewhere for over a month, during which time the carpets had been taken up and some of the walls repapered, others white-washed, and disinfectants had been extensively used. On her return to her old quarters, she went into a room in the back-building, distant some sixty feet from the room where the first patient had died. She took the disease and died in a few days—a spark of contagium, not removed, carrying death before it!

Some years since we went on duty, in the month of March, in a hospital where there had been a number of deaths from typhus fever; we ordered tents to be erected in the yard, and that each case as it appeared should be taken out of the building and laid in these tents. The weather was so cold and damp that large fires were kindled at the doors of the tents. Seventeen cases were so treated, and not one of them died. Why? The medical treatment was very much the same as with the cases which had died indoors. It was the outdoor,

pure, well ventilated air which so wonderfully decreased the mortality!

The sick require more air than the well—at least from 3500 to 3700 cubic feet per head every hour. In the Dublin Laying-in-Hospital, the deaths of newborn children amounted in the course of four years to 2944 out of 7650 births. After a new and effective system of ventilation was adopted, the deaths in four years amounted to only 279. Thus, more than 2500 deaths, or one to every three births, must be attributed to bad ventilation.

In the badly-ventilated prison of the Leopoldstadt, in Vienna, in the years 1834 to 1847, the proportion of deaths was 86 per 1000; out of which number, 51.4 per thousand were due to consumption; while in the well-ventilated House of Correction in the same city, the deaths were 14 per 1000, of which 7.9 were from consumption. It follows then that 43.5 cases per 1000 were deaths attributable to nothing but foul air.

Before the Crimean war, the health of the British army was very bad; at least two soldiers died for every policeman. Foot Guards, 20.4 per 1000: Infantry, 17.8 per 1000; Metropolitan Police, 8.9 per 1000. The soldiers were picked men, better fed, clothed and lodged; but the air in the barrack dormitories was foul to a disgusting degree, and the air-space insufficient. Now, the death-rate amongst soldiers, thanks to sanitary improvements, is no more than that of the police, and not more than one half it was before. So, in the French army, improved ventilation in barracks has given similar results.—The British army, when in the Crimea, were lodged in tents during extremely rigorous weather, yet experienced a wonderful condition of health, such a thing as a cold being an unknown complaint; but when some of the men were placed in huts, which were much warmer, and into which there was a smaller circulation of fresh air, the sick rate increased, and coughs and colds began to appear. (Hartley.) Persons, who, during summer and winter, sleep with their bedroom windows more or less open, cannot endure a night spent in a room with chimney closed and the window shut.

But there are poisons in the atmosphere which produce and promote disease, and yet are not known by any odors. "It is," says Dr. Simon, "of the utmost practical importance to recognize, in regard of Filth, that agents which destroy its stink may yet leave all its main powers of disease-production undiminished. It is certain that the ferments of disease, in doses in which they can fatally infect the human body, are infinitely out of reach of even the most cultivated sense of smell." The bacteria, the corpuscles, organic germs and sporules, give us no warning; neither do the vibrious, miscrococci, microzymes, nor the zoogloœa, &c. Whether the germ theory of diseases of Dr. Beale, or that held by Burden Sanderson, Lister or Tyndall, is correct or not, we know that the antiseptic method is wonderfully successful, and that the purer we keep the atmosphere, the less virulent are the poisons. The poor comparatively suffer but little from enteric (typhoid) fevers. It is only the well-to-do who can have sewers in their houses, and sewers often become the real channals by which the contagium is propagated, in consequence of badly-trapped and imperfectly ventilated drains. During epidemics, parents frequently keep their children in the house, for fear that by walking in the streets they may contract the disease. Never was there a greater error. By staying indoors they breathe the same atmosphere, but with additional impurities—impurities which promote contagion.

Another prominent cause of the unhealthfulness of house-air is the high temperature at which it is ordinarily kept. Day and night the thermometer registers frequently 75° F. or even higher, when 65° F. ought to be the highest for waking hours, unless for very old people, and 60° F. for sleeping hours. Overheating, especially by dry furnace air, overtaxes the skin and causes coughs, colds, sore throats, &c. "Catching cold" is a misnomer; cool air is healthful, provided the clothing is well adapted for the season. Hot air is relaxing, and renders people too sensitive to the lower temperatures. Especially is this the case with children, who frequently fall victims to the lamentable ignorance of their mothers of the simplest principles of hygiene. They are literally smothered by being

forced to breathe devitalized air, and their feeble organisms are exhausted by its high temperature. It saddens one to reflect upon the fearful mortality among the young children in our cities. Nearly one-third die in their first year, and one-half before the end of their fifth year. Vital statistics prove that this results in a great degree from preventable causes, which include foul air and excessive heat.

. Let it be borne in mind that night-air in towns is purer than day-air, because there is less smoke, less dust, and less of foreign substances floating in it. Dry, hot air frequently produces pulmonary hemorrhages—the starting point of pulmonary consumption. When persons are convalescing from diseases, they recover the more rapidly if we can get them out of doors. The fresh air with its ozone soon shows its beneficial effects.

We are all familiar with the fact that house-air promotes diseased conditions which are frequently attributed unjustly to "teething," "cold," "dyspepsia," &c., &c. It indisposes individuals to exercise; it impairs their appetite; it renders their sleep less refreshing, and finally it deprives them of sunlight in a great measure. Thus the blood is rendered paler in color and less rich in red globules. The absence of ozone makes the oxygen less vitalizing. Dr. Richardson has shown us, by experiments, that absolutely pure oxygen failed to sustain life until it was subjected to the action of the electric spark, when it regained its activity.

CONCLUDING SUGGESTIONS.

After all, we must live in houses; we must be protected. Very true. What then are we to do? *We must try to keep the house-air as near in purity to the outdoor air as possible.* This can only be done by ventilation; by keeping it in motion, and renewing it by air from the outside. In large buildings, shafts and mechanical apparatuses of various kinds are employed; but in private houses this cannot well be done. There we must rely mainly upon Natural Ventilation. If the cubic space is small, the renewal of air will necessarily be much

more frequent. If the space is only 100 cubic feet the air will have to be removed thirty times per hour to keep up the standard amount. If 1000 cubic feet is the space, then only three times per hour; if it is 424 cubic feet, six times per hour. This becomes almost impossible without artificial means. Prof. Wilson gives his opinion, that if the space be less than 600 cubic feet it is difficult to avoid too great draughts. In the crowded dwellings of the poor the space seldom exceeds 200 to 250 cubic feet; the increased rate of mortality is the result.

The force of gaseous diffusion is not sufficient for a ventilating force. The products of respiration and combustion are diffused through the room, but the organic impurities are not taken away. Large rooms are much more easily ventilated; yet we daily see persons from choice living in small apartments. The cubic space is small, and then they fill up the rooms with beds and unnecessary furniture These impede the currents of air and interfere with ventilation. The smaller the number of corners and surfaces the better.

We should be accomplishing an admirable sanitary reform if we could only persuade housekeepers that, *whenever there are smells of any kind, they are caused by organic particles floating in the atmosphere which may produce disease.* To test the purity of the air of a room, it is a good rule to go out for ten minutes into the outdoor air and then return. If it seems close, or odors are perceived, the windows must be opened. If on again shutting them the impurities are still cognizable by the senses, more air is necessary. Unfortunately, persons living in houses where there are odors become accustomed to them and are not really aware of them. The sensibility of the nose becomes blunted. What is offensive to persons coming in from the open air is not noticed by them.

The modern mode of having the staircases in the middle of the house, thus removing the front from the back rooms, interferes with ventilation and renders the air almost stagnant. The so-called well-houses, with a column of damp, musty cellar-air distributed through the centre of the house, cannot but be injurious, especially as the top of the well is

carefully covered over to prevent the escape of the air above, and to exclude the sunlight, as if its rays would cause blindness. It stops cross-ventilation through opposite windows—the readiest and surest means of removing impure air.

The warm air of the inside is of course lighter than the cold air outside; thus we have a constant interchange. The expanded interior air escapes, and the air from the exterior rushes in to establish the equilibrium. If the difference is very decided the air moves rapidly, at five or six feet per second, and the current is unbearable if one's person is exposed directly to it. With care, however, this perflation can always be used. While we ventilate we must warm. By open fireplaces we do both, and healthfully. The aspirating action of winds produces upward currents of air through chimneys, and air is drawn in to supply the partial vacuum. Even if there is no fire, the chimney acts as a good ventilating shaft. It should never be closed by a fire-board, no matter how ornamental it may be made. If cowls are put over the tops they assist in aspiration force. *Open fireplaces ought to be in all rooms, especially where there are sick people, even if the rooms are otherwise heated.* The amount of air found going up chimneys is a most reliable index of the fresh-air supply. They draw the air in through every chink and hole and corner, and even through the walls themselves. The weather-strips, as they are called, used to prevent air from entering around the sashes, ought to be prohibited by law.

Unoccupied rooms ought always to have the windows open, unless the temperature is so very low that it is impossible to heat the atmosphere by the time they are needed. Let it be done as far as it is possible. Some outside air ought to be allowed to come into bedrooms throughout the night, unless the temperature gets below 50° in winter. Bedrooms should invariably be supplied with a magazine of fresh air before bed time.

The windows of dining-rooms ought invariably to be thrown open after meals, and they should not, if it can be avoided, be occupied at other times. During the night the windows of the halls, dining-rooms and kitchen should be kept open, so

as to let in a magazine of fresh air and carry off impurities collected during the day. Over the front doors there is generally a transom, which can be put on hinges and kept open in the daytime as well as by night. Or there are small windows on either side of the front door which can be opened or shut at pleasure. If necessary, panels can be cut out of the door itself, and ornamental iron gratings substituted for the wood, and glass put inside. If, in addition to this, windows on the passages in the upper stories are kept open, we can have a fresh supply of air passing through the halls. If this was done habitually we would not have the musty atmosphere of halls loaded with organic matters, which so frequently annoys us as we go from the fresh air into boarding-houses, hotels, and many private houses. Persons might then get some fresh air when they open their bedroom doors at night, instead of the polluted air they usually get.

The windows of bedrooms in winter should be opened as the persons leave them after dressing. It is a mistake to open them immediately on rising or while dressing, for the system is relaxed by sleep and fasting, and is easily impressed by the sudden change. If the outdoor air can be warmed properly as it enters by passing around the chimney so much the better. If artificial holes can be made it would be advantageous, or if Arnott's valves could be fixed in the chimneys; but in most private dwellings we must rely upon the windows. True, more fuel must be consumed. Is not the additional expense a small matter compared with the healthfulness resulting from it? *Fresh air is better worth paying for than even food; it is more essential to health.*

It must be borne in mind that the reckless opening of windows does not constitute good ventilation, although it will furnish us with an abundant supply of fresh air. Good ventilation consists in furnishing pure air, but without draughts. An almost imperceptible breeze moves at the rate of eighteen inches per second, or one mile an hour. This is sufficient to renew the air unless the room is of very small dimensions. Opening a window in winter, owing to the expanded overheated air, frequently makes an unbearable

draught; but even on the coldest day generally a chink may be left open at the top. If the residents are protected from the column of cold air, there is no danger. A good plan has been suggested, of lifting the lower sash two or three inches, and substituting a piece of wood the whole length, and thus closing the opening. The air then enters between the sashes and passes upward toward the ceiling; it thus mixes gradually with the air of the room, and there is no rapid current. Or better still, if a piece of wood be fixed to the edge of the upper sash when it is lowered, so as to direct the fresh air upwards. "Maine's patent window-ventilators" are based upon this principle, and are admirably adapted for practical use.

Official Sanitarian.—We have inspectors of houses, as to the materials used, the thickness of walls, &c. Why can we not have a City Sanitarian—one who understands his science, whose duty it shall be to see that houses are constructed with due regard to the entrance and exit of air? He would see that the water-closets are placed in the best positions and are properly constructed. Certainly, such a person would not permit a water-closet to be where the windows of the room do not open into the open air. He would insist that the foul-air pipe should be inserted high up the chimney, or if that cannot be, that it be carried up straight to the top of the house; and above all, that Jennings' or some other well constructed basin-and trap should be used, so that a large volume of water, by thorough flushing, should carry off at once the sewage, and the valve should keep the foul gases from rising and penetrating through the house. Many lives would thus be spared, and epidemic diseases prevented from spreading. *Neither diphtheria, scarlet fever, nor any other zymotic disease would make headway, if householders would only let plenty of fresh air and sunlight into their dwellings, and attend to their sewerage;* using also plentifully water with chloride of lime, copperas (3 lbs. to a gallon of water), or any other reliable disinfectant. We should be sure that the furnaces were supplied with air by pipes of large diameters from the external air, and not from the impure air of the cellars, to deteriorate

still further the already impure air of the house. When houses are heated by hot-air furnaces, care should be taken to have water evaporated at every register.

Let us remember that the true use of carpets is to keep the feet warm, and where no one walks, there ought to be no covering of the floor, for carpets and other woolen materials retain organic matters, which are deposited from the atmosphere. These undergo changes and produce disease. Carpets, curtains, &c., also collect the products of disease itself—the virus of small-pox, scarlet fever, diphtheria, typhoid fever, and similar diseases. Carpets ought only to be in the centre of rooms and halls. They ought to be taken up and well shaken, and exposed to the outside air several times during the season, *In sick-rooms the floors ought to be bare*, and all curtains of woolen material removed. Let the practitioner always insist upon open fires and sunlight in rooms where the sick are attended. Let him watch closely the temperature of the atmosphere, as well as of the patients themselves, and see that the plate or cup containing food, especially milk, is not exposed to contamination by being uncovered. Above all, let the nurse see that all night-vessels contain disinfectants, and that their contents are instantly removed from the room. The burning of sugar or pastiles to destroy odors is only the substitution of another odor and an addition to the impurities. *The open window and the current up the chimney, are the only effective means of getting rid of the contaminations of the atmosphere.*

In conclusion, we entreat all, especially parents, to bear in mind that rebreathed air, or air deprived of its proper proportion of oxygen by any means, is not healthy; and, if it also contains organic matter and the results of combustion. it is beyond a doubt, poisonous. Sooner or later, its effects will be felt; if not in acute diseases, the constitutions of the inhabitants will be impaired, and the seeds of organic disease be sown.

Nature intended that we should breathe only pure air, and byso doing we keep off disease and prolong life.

HEALTH A PREREQUISITE

TO

National Success in Peace and in War.

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Health a Prerequisite to National Success in Peace and in War.

Success, whether personal or national, depends upon numerous contingencies. There must be certain antecedent conditions before one can even dare hope to secure it. These are moral, intellectual and physical. When they are present in due proportion success is always a probable result, if it be not forbidden by the very nature of the undertaking itself. If partially or wholly absent failure must be anticipated in the place of success. The general proposition, as applied to the moral and intellectual factors, is universally admitted. Every one can readily see that there must always be moral principle and some order of intellectual development present to ensure success, but the antecedent physical condition of health has not commanded the attention it deserves at the hands of publicists. It is proposed in this essay to dwell exclusively upon *it* as a necessary prerequisite to national success, and on this account to urge the subject of Hygiene upon the attention of our National and State Legislatures as of paramount importance. The old Spartan recognized the truth, that we shall endeavor to present, practically. He exposed the young in such manner that the weak and puny—those whose constitutions were not of the strongest natural character, broke down under the exposure, while the others, who survived this brutal ordeal, were likely to grow up with such bodily health as would enable them to assume the duties of a rugged manhood, and to add by their prowess to the military fame of the nation. And thus the Spartan practice showed how they feared the burdens that the sick and weakly child might entail upon the nation, as well as how earnestly they longed for such citizens as would enable them to secure a continuation of success in the rough contests their very mode of existence obliged them to keep up. Other nations of less intellectual culture practically recognized the same truth also by ridding

themselves of the sick and aged adult when he ceased to add to their strength and prowess. For what possible use could a man be unless he was able to contend in the front rank with his companions, to aid them both in the hunt and the fight. Still, wherever Christianity has existed, or those instinctive notions of humanity that adhere to the soul in its normal condition have manifested themselves, tenderness to the decrepid and sick are found prevalent. But to secure the results which the Spartan attained in his mode of selection, to promote health in the healthy and to secure it for the sick, to retain the greatest amount of vigor for the use of the body politic by systematic scientific legislation, these have only become subjects of study in modern times, when science and philanthropy have joined hands in their efforts to solve the problem.

The *mens sana* is an intangible and indemonstrable something, unless it possesses a *corpus sanum*, as its instrument or tool, by and through which it can make its presence felt, and demonstrate its wondrous powers. We are not ready to accept the materialistic view that, because a diseased brain does infallibly affect the immaterial something which must employ it through all its thinking, or because each mental operation causes the destruction of cerebral substance, the mental power has its *fons et origo*, in the highly organized instrument so essentially requisite for all its active operations. We are not ready to accept the materialistic theories of mind, although we must admit that modern research shows that the mind is unable to accomplish its normal work, unless the brain is in something like a normal condition As in the use of steam, although it may be generated by the application of a proper amount of heat to water, still if the machinery, by which its expansive force is to be made efficacious, be not adapted for its employment, it is either useless, or becomes extremely dangerous, instead of highly useful; and all this without the necessity of our recognizing the engine as the generator of steam, so the mind, for the want of a suitable organic medium for its active exercise, may either manifest a powerless idiocy or the terrific power of insanity.

The brain must be in a healthy condition to ensure normal mental activity. But without the mind is in a state of normal activity, there can be neither individual or national success. There must be vivid, acute perceptions, careful accurate generalization, abundant skill in analysis and synthesis, and the habit of rapid, though certain deduction, all of which are needed to grasp what is known, and to lead to useful discoveries in what is knowable amid the unknown. All this is not only required in leading minds that give shape to the practical activity of a nation, but by the masses who are to carry out the conclusions attained by these minds, and to make them practical and useful. Hence we arrive at the first point in our investigation, that mental activity—which is the life and soul of all forms of successful activity—is dependent upon that normal condition of the cerebral organs, which can only be found in health. An abnormal brain, or a brain in a morbid condition, cannot admit of such mental activity as will result in the origination of those plans that are the basis of success, or in their efficient development and practicalization even when formulated.

And yet a healthy brain and nervous system, are such rare phenomena at the present time, that one may almost query, whether they are not in their very nature, exceptional? With the high-pressure, under which Americans prefer to labor, the brain and nerve-force seems to have been thoroughly used-up long before the time allotted as the natural limit of human life, and then, in lieu of its mighty vigor, we find nought but the certain indications of its slow, but gradual extinction.—Abuse of highly organized tissue must result in utter loss. Hence we find our professional and literary men forced to lay aside their studies at an age when they should be in the very prime of their strength, and to seek recreation after the ability to recuperate has been entirely lost. The ranks of the army of valetudinarians, that crosses the ocean yearly for the vain purpose of seeking the health they have rashly thrown away, are yearly increasing, while its members find too late, that the fountains of health, when thoroughly polluted, are beyond the curative influence of any purifying agency. Each victim

of such suicidal treatment of his brain, comes to a realizing sense of how little he has accomplished, by unduly taxing its power, without the employment of regular intervals for rest and recuperation, in comparison with the greater work he might have accomplished under other and more rational self-discipline. But this is attained at a period too late for remedy, and he drops out of the ranks of mental laborers to make way for others, who will probably derive no benefit from his example, and thus, we are having spasmodic brain-activity, and loss of longevity, instead of a uniformly increasing brain-power conjoined with longevity.

Necessarily, then, a mental activity which is not uniform, but spasmodic, and which is associated with such a drain upon the vital powers as to destroy their integrity, which, in a word, does not depend upon health, but upon morbid paroxysms, is not adapted to success. It is true that the brain is liable to be affected in many ways by disease, independent of mental effort, and that, notwithstanding the greatest possible care, it may still take on such morbid action, but this does not proceed from any normal, regular exercise of all its powers, or from a systematic employment of its functions properly relieved at stated intervals by rest, for the purpose of recuperation. It is the spasmodic overwork that racks the machine and speedily puts it beyond the possibility of repair. It is this that lays the master-mind under the ground just when all his bright conceptions are attaining full realization, and when success is about bursting upon his vision. It is this that shatters the brain and shortens the period of human intellectual labor, that brings on the series of morbid phenomena that baffle the pathologist as well as the therapeutist. And yet, constant, *steady* mental labor, if properly varied, may be performed for many years with less permanent injury than a month devoted to the spasmodic over-work now under consideration. All parts of our wonderful microcosm were created and adapted for regular labor, but in accordance with laws that demand due recognition of their existence and obedience to their requirements. Illustrations of this fact are abundant with the German students. They perform immense tasks,

have a proclivity to dive down to the very depths of every subject they take hold of, but they are never hurried. *Ohne Hast, Ohne Rast*—unhasting, unresting. Brilliance is not a characteristic of these students, but accuracy, certainty and reliability, so that their conclusions are always received with unfeigned respect, even by those who oppose them. They reach success eventually, when others are forgotten, whose meteoric brilliancy—the result of abnormal employment of mental powers—for a while dazzled but was finally extinguished in impenetrable darkness.

Let us now glance at the effects of disease in other portions of the human economy. Let us imagine the anomaly of a heathy mind in a diseased body, of a healthy nervous system presiding over circulatory, digestive and muscular functions in a state of disease, and see what hopes of success exist for the individual who possesses this anomalous arrangement. To use the illustration of the steam engine again, of what value would be the best possible boiler constructed so as to economize the greatest amount of heat furnished by the fuel employed, and to supply the greatest amount of steam of any desirable degree of tension, if the piston-rods and valves were defective, if the machinery to utilize this great steam-power was inadequate to the task imposed upon it? Such an inadequate arrangement is possible in an inorganic combination, and we can see how utterly useless it would be for practical purposes, how the manufacturer would fail to receive a proper return for the expense and labor expended upon his machinery, how a much inferior boiler, with effective machinery in good order, would meet his wants and be acceptable for practical purposes.

To insure permanent success health must reign throughout the *whole* body. Here the folly as well as the injurious results of many of the amusements, at present popular throughout the land, comes vividly to light. The boating and base-ball mania that has seized so many of our colleges with the consequent huge development of certain muscles and overstrain of the nervous and circulatory systems, the excessive practice of gymnastic exercises in any form, the habit of exposing the body to extremes of temperature without due pro-

tection; all these afford painful illustrations of the effects of overstrain of certain portions of the body without proper consideration for the due development of other portions, quite as important to a state of normal health.

The command to earn bread by the sweat of the brow did not imply an overtasking of any portion of the body, but the due exercise of all its functions, with proper intervals for rest and repair of waste. The habits and customs of civilized life are seemingly directly opposed to such requirements. Among these are the disguises which food is made to assume in its preparation for the table, the condiments it receives from the fashionable cook to make it attractive to morbid appetites, the temperature at which it is eaten—sometimes far above that natural to the body, and again as nearly approximate to zero as the frigorific mixtures to which it has been exposed will bring it—and, above all, the rapidity with which American habit is accustomed to force such heterogeneous mixtures into the patient, long-suffering stomach, and the unseemly hours during which this same organ is forced to toil and labor when it should be at rest. Our clothing is also an obstacle to health. The child is clad, not in accordance with the teachings of physiology, but with the insane ravings of fashion. At an age when rapidity of growth requires that it should be protected against extremes of temperature, portions of the body are exposed in midwinter without any protection, so that the little victim is blue and chattering from the cold instead of glowing with the roseate tinge that should mantle the cheeks of a well-clad child. Then the evil results of overcrowded population, subjected to no sanitary regulations, or so restive under them as to employ every possible means to thrust them aside. These have become so serious in character, on account of the distress, suffering and death they have caused, that one is almost compelled to recognize, from a sanitary standpoint, the propriety of the cynic's designation of a city as "an ulcer on the body politic;" they challenge the most careful attention of all thoughtful minds, sanitary and medical, in the country to discover how they may be reduced in character and number, if not wholly eradicated.

Thus the body is not only unfitted for its work by an undue use of certain organs, but, even where there is moderate and temperate use, the habits of civilized life interfere with repair of waste and expose it to malarious and other atmospheric causes which sap the foundations of life and lead to untimely death. The brain is overtasked until it refuses to perform the labors imposed upon it, and disease renders mental effort an impossibility; the muscular system is similarly treated and premature senility visits organs that might have been active and useful to a moderate old age; and where neither of these errors have been committed the habits and customs of civilization so enfeeble the body that both mind and body expend their power at an early age and readily yield to the slightest attack of disease, or rather lose what constitutes health, and hence are diseased.

But these results are incompatible with success in the world. It is not the sickly brain and the emaciated body that ordinarily lead the van in the professions, in the trades or in any avocations, whether pursued on land or sea. There are rare cases where a gigantic will enables a man, as it were, to overcome the clogs that his mortality lays upon him, while he wields the pen, pencil or chisel of genius, electrifies nations by his wondrous plans for their progressive advancement, contrives machinery that puts new industries in operation, or directs enormous mercantile enterprises. We look upon all such cases as exceptional, and are ever ready to give special credit to the will that conquers such tremendous difficulties and rises triumphant above the depressing influences by which it is environed. Ordinarily a totally different result is expected, and success demands in the individual just that *mens sana* in *corpore sano*, to secure which for all men is the end and object of all hygienic labor—the sum and substance of the theories and practice of modern Hygiene. We fight disease, we contend steadily against morbid influences, simply because we long to secure for the race the full measure of years to which it may be entitled and the greatest possible vigor of body to carry out the duties that fall to its lot during its earthly existence. We labor to secure health and

long life, because these tend to insure that *success* which makes man best meet the earthly object and end of life, and all this without reference to the particular sphere of labor to which the individual may be called.

Let us now look upon the relation of health to national success. While the nation is an aggregation of individuals, it is at the same time a political organism, subject to laws and conditions which more directly affect its members than would be possible in a mere aggregation. Were it the latter alone there would be no oneness of spirit pervading its citizens, no effort would be made for success as a nation in the arts of peace, and no other motive for success in war than that which bind casual travelers together to resist the attacks of wayside robbers and murderers. But where men, whether related by ties of affinity or drawn together primarily by necessity or choice, have a national instinct developed, it seems accompanied by the nucleus of a social vitality which, in time, binds them together as a political organism, separate and distinct from all other nations, endowed with distinctive interests to secure which is one of their principal aims in peace, and for whose protection they will take up arms and risk their lives. How can health secure the success of such a political organism in peace and in war?

Every hour of sickness is so much genuine pecuniary loss to the nation, of which the individual is a constituent portion. It not only keeps him from contributing his own quota towards the general intellectual and material wealth of the country (and that is a serious loss in itself), but it also consumes the energy and labor of many others by absorbing their time and attention in ministrations to the sick, so weakens the energy of others by the anxiety they undergo that their duties are performed only with a minimum of their native energy, and monopolizes the faculties and time of others still whose profession requires them to apply themselves solely to the treatment of disease. Could we reckon up the sum total of this loss to the nation the figures would probably be considered a strong argument in favor of hygienic study and inflexible hygienic practice of the most cogent character. Each

particular case of disease in itself does not seem to abstract much strength from the body politic, but the aggregate of all the cases that may prevail in any given year, comprising those laboring under chronic or acute maladies, old and young, rich and poor, cultured and ignorant, workers with the brain and those who merely employ muscle; take all these and then the classes of persons who are affected by the sickness prevalent, give a pecuniary value to the loss really experienced, and show what a bane sickness is to a community. It is said that whatever touches the pocket reaches the most vital part of the man of business; is there not here an argument sufficiently acute to penetrate to this sensitive centre and to produce an earnest anxiety that this immense annual loss should be diminished as far as possible by the due recognition of the necessity of sound sanitary regulations and their impartial administration. The wise man of business shows his wisdom and skill not only in the accumulation of wealth, but in its proper preservation, and whenever chronic losses attend his steps he feels that he is not successful.

Let us now see how the want of healthy tone in its citizens affects the success of a nation, and the investigation here requires an inquiry into its effects upon brains and muscle-workers separately.

To control and direct always requires a higher order of talent than to execute. This fact is recognized by the world, inasmuch as it freely awards the inventor a larger compensation than it is willing to give the machinist who constructs in accordance with his plans, and the honoarium, which the professional man receives, bears no relation to the time required in any particular case, but is fixed with due regard to its magnitude and the years of antecedent preparatory labor he has spent in preparation for professional work. Thus brain-work is recognized as something of the highest value, because without it there is no advance, no improvement, nothing but dull stagnation. When the thinkers of a nation are actively at work all is life and activity throughout its length and breadth; agriculture extracts from its rich soil, made richer by artificial fertilizers, food

for the support of its citizens, manufactures increase in consequence of the invention of ingenious machines, lowering price and increasing demand, commerce enters all the ports of the world and secures a ready exchange for its natural products and the results of its manufactures, the fine arts begin to thrive and cast the refining influence of their culture over rich and poor, and legislation becomes better adapted to meet the wants of all and to throw the protection of law over all portions of the body politic. But this is attainable only where healthy brains are active, and not where effeminacy or any other deleterious agency has impaired the vitality of a people. The example of Rome is a trite one, and yet its value can never be overestimated. The Roman had ceased to be a vigorous thinker, had lost his robust health when he yielded to the seductive charms of luxury and learned to find his greatest happiness in the cultivation of effeminacy and vice. Then the fall of the national greatness began, and Rome became an easy prey to barbarous nations. It is a fearful period in a national history when its citizens begin to disregard those laws that regulate high physical health, and thus pave the way for the neglect of the arts that insure its prosperity. The loss of a heathy tone of body with its thinkers becomes the premonitory indication of a loss of its greatness.

The want of healthy tone, also leads to the deterioration of those who are to carry out the plans and execute the thoughts of its brain-workers. The best laid plans are useless unless they are vigorously carried out by those who undertake their execution. And, as there can be no vigorous labor except where health prevails, so all the activity and energy that should manifest their presence, wherever agriculture, mechanics and commerce are cultivated, must depend upon the existence of such health. The muscle that directs the plough, the plane and saw, or the course of the vessel over the broad ocean, must receive its tone and vigor from genuine bodily health. The earth is to be penetrated in search of precious or useful metals, canals are to be dug and railroads built for the purposes of free inter-communication between distant re-

gions, edifices for private comfort or public convenience are to be constructed, the countless requirements of an advanced civilization are to be satisfied; all these are demanded in time of peace, and the demand cannot be met unless health nerves the arm and gives tone to the human muscle that is called into service

Peace is the blessing most attractive to the civilization of the present age. Nations no longer recognize the battle-field as the only plain on which they can best contend in fair rivalry with each other But peace does not imply indolent stagnation, for rather does it demand earnest, active, untiring labor. Its banner floats most proudly over citizens who are striving to advance their national greatness by new triumphs over nature, by new victories over difficulties that may have proven obstacles to their ancestors. It is no friend to sloth, and cannot long survive failing physical strength. Just as the human body, when once under the power of disease, is an easy prey to every deleterious influence floating in the atmosphere, so a nation, when the glow of health no longer marks its citizens and stimulates them to continued exertion, becomes an easy conquest to its enemies. It has suffered its locks to be shorn, and the effect of Delilah's work becomes evident when the hour for the trial of its strength is at hand. Thus, although we do not claim health as the only prerequisite to national success in peace, we see it is a condition which cannot and dare not be overlooked, because it gives strength to the arm and energy to the body, whose activity must more or less determine this success.

There is also another advantage resulting from health that may require a word, and that is, the patience and cheerfulness which it gives to the citizens. Impatience and discontent are frequently present, even in the midst of material prosperity, and they always detract from the happiness of a people, but where health reigns they are not so much at home, and can with little effort be driven away. Patience and cheerfulness are not found where malaria abounds; they do not reign amid the polluted atmosphere of a crowded tenement-house; they have no home where bad food and inadequate clothing pre-

vail; they are not the normal companions of suffering, distress and disease, but they are most naturally and frequently met with, where health reigns and dispenses its great blessings. And are they not necessary to success—can indeed, there be full, satisfactory success without them?

The conditions which ensure success in peace are precisely those that prepare a nation for war, whenever it breaks out. Love for home is intensified when the latter has become the abode of happiness and prosperity, and will array a people quickly in arms should danger threaten from within or without. But how is health a prerequisite to success in the troublous times of war?

If her best minds are ever needed in the history of a nation, it is when she undertakes to carry on a war. Presumptively her enemies will avail themselves of all the talent at their command, so as to intensify their own strength, to detect the weak point of those against whom they are to contend on the field of battle, to employ every fair, and even unfair means, to secure their own success at any and every cost. All this must be met and counteracted by minds well-read in the lore of the military art, quick to comprehend the necessities of a campaign, ready to recognize the wants of their own soldiers, and their strong as well as weak peculiarities, and always prepared to present new plans for new exigencies as they may arise, possessed of great executive ability that will manifest itself, not only in the establishment of thorough discipline among the men, in providing food and clothing suited to their wants, and in selecting and superintending proper subordinate officers, but shining pre-eminently bright in the midst of battle, so as to secure not only victory, but to make the best use of the same after it has been won. Such minds are not commonly met with in valetudinarians, but in men of sound health, and without them a nation may pour out its wealth and its best blood upon the field of battle to no purpose. If given to the doubt and hesitation that spring from diseased bodies acting upon imperfectly balanced minds, if harassed by bodily ailments that interfere with the normal exercise of cool judgment, the military knowledge of commanding officers will

only serve to show how unfitted they are to take charge of the honor and safety of a nation.

We say, then, that health is an essential requisite in the case of the commanders of armies, because they need full possession of all the faculties of mind and body to superintend and conduct the operations entrusted to their care, and that the nation which overlooks this qualification exposes itself to certain discomfiture and defeat. But health must also pervade the ranks of those who are to execute the plans of the officers, in order that they may endure the hardships of camp and garrison life, press forward in time of battle with enthusiasm and courage, bear the wounds received from the enemy and the necessary surgical treatment these may require, and, in a word, be ready to do and to suffer for the national cause in every situation they may be placed. The truth of this proposition will readily be admitted, and yet it has only been practically recognized in these latter days in the way of supplying sanitary aids and supervision so as to guard the soldier's health throughout the whole of his exposure and peril.

If our discussion has sustained the proposition proposed at the outset, what practical lesson necessarily presents itself to our minds as a legitimate deduction from these truths? Undoubtedly, that since health is necessary to national success, it is incumbent upon government to give serious consideration to the subject of sanitary science, to enact laws in regard to the sanitary conditions of the cities and towns that will cause the banishment of morbific causes now prevalent, although preventible, and to spread before the people all information that will aid them in securing the greatest possible freedom from disease. Economy of life and health is an economy that should attract the attention of our municipal, State and National councils, because citizens in the vigor of health are the sturdy supports on which the wealth, dignity and prosperity of a nation largely depend.

The question of sanitary science is not only of interest to the physician and publicist, but it comes directly home to every one. It may be that in health we do not so readily recognize the mutual dependence of the citizens of a commu-

nity upon each other, but when contagious disease appears in any locality, the brotherhood of men is at once established by the readiness with which the subtle poison exerts its power on all sides regardless of position in the social scale of the individual in whom it was first manifested. Hence the general health of a community depends upon sanitary conditions that prevail throughout all its families, and it is just as important that the lowliest citizens should be cared for in this regard as the wealthiest and most cultured.

LOCAL CAUSES

OF

INSANITATION IN BALTIMORE.

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Local Causes of Insanitation in Baltimore.

Perhaps there is not a city in the United States, certainly not one of equal size, the topographical position of which is so well adapted to secure health to its citizens as Baltimore. That its death rate is not as low as the lowest in the country can readily be understood when the many preventible causes of disease which exist within its limits are pointed out and the manner in which these causes operate fully explained. The investigation of this subject is the object aimed at in this paper.

Among the diseases of a zymotic character due to unsanitory local condition are, as is well known, diphtheria, typhoid fever and scarlatina, all of which prevail to a very serious extent in Baltimore. One hundred and eighty-four deaths from typhoid fever alone occurred during the past year, while deaths from the same cause in the city of New York, with a population three times greater, numbered but two hundred. This is a startling statement when taken in connection with the fact that every case of typhoid fever is due to a local cause, and that that particular cause can, in nearly every instance, be ascertained and prevented, if due pains be taken; and, further, that as a consequence, every case of death from this disease is the result of recklessness or ignorance. Diphtheria, too, has its origin in filth. Dr. Snow, the Health Superintendent of Providence, R. I., one of the best sanitarians in this country, says in his last report:

"The evidence constantly accumulates in this city, that diphtheria depends for its existence and prevalence upon foul air, arising from local conditions of filth. Though it is innoculable, and in that way contagious, and is, perhaps, to some extent, infectious, there is no evidence that practically the disease is propagated by innoculation, or contagion or in-

fection. We may expect that diphtheria will continue through the winter, though perhaps with less severity than during the last two months; but it will still continue to search out its victims among those whose constitutions are prepared for it, by breathing foul air and other depressing causes."

Slight epidemics of diphtheria and scarlatina have also prevailed in the southern and southwestern part of the city of Baltimore. To account for this unusual prevalence of disease it will be necessary to seek out the causes most likely to operate injuriously, and see how far they obtain in our midst. To do this requires a thorough examination of the drainage and sewerage system of the town, as well as the condition of wells, cellars, pavements, water closets, privies, &c.

DRAINAGE.

The drainage of Baltimore, as is well known, is largely of a surface character, to which the city is well adapted, owing, as I have before stated, to its topographical advantages. The subterranean drainage is peculiar and will be fully described hereafter. I am convinced that very little disease arises from bad drainage in the city proper, save that arising from defective kitchen drainage, but in the suburbs and outlying grounds there are numbers of low vacant lots, the foci of malaria. These are to be found in every portion of the city, even in the neighborhood of such well improved sections as Franklin, Lafayette and Harlem Squares. To the existence of these beds of miasmatic poison may be ascribed the great amount of malarial fever that has prevailed in Baltimore in the year 1877. It is a notable fact, that whilst the small towns and the country in the vicinity of Baltimore have been unusually free of malaria, the city itself has suffered in a very marked degree. (Diphtheria has prevailed at Waverly, owing to the fact that the sewerage of the village is suffered to empty into a large open lot.) The digging of new sewers, particularly the extensive one in Carey street, no doubt added to this cause. In this last locality there was an unusual amount of sickness, including diphtheria. The drainage in the neigh-

borhood of the Spring Gardens is notably bad, and, unless remedied, must always prove a fruitful source of disease, most certainly so when other factors, hereafter to be mentioned, are added. The drainage in the eastern part of the city from Loudenslager's Hill in every direction is wretchedly bad, and though somewhat improved, through measures taken by the Health authorities, is still defective and a reproach to an enlightened community. I shall dwell more in detail upon this when I come to speak of Harris' Creek and the outlying spaces north of Loudenslager's Hill. Another portion of the city that is badly drained is a small peninsula north and east of Lancaster street, which was the seat of the late outbreak of malignant yellow fever.

SEWERAGE.

The sewerage of the city is extremely defective, and is no doubt the source of a great deal of the disease that prevails during the summer and autumn months. The sewers are too few in number, badly constructed, and when not flushed offensive to the smell. The condition of Harford Run, that of Chatsworth street, and also that of the filthy stream running from Cross street to Spring Gardens, is exceedingly bad, and the attention of the municipal authorities was called to it by the Health Commissioner in his last annual report.

The study of the evils of the drainage and sewerage systems of Baltimore, and the means for their correction, have engrossed my attention for a length of time; and, with a view to secure the most enlightened judgment concerning them, I have conferred with accomplished engineers and gentlemen skilled in sanitary science. One of them, Mr. Richard Randolph, C. E., has kindly furnished me his views on the important matters referred to, which I here subjoin, deeming them of the utmost importance, from the fact that they are based upon an intelligent examination of the whole subject:

"The city of Baltimore, owing to the nature of the ground upon which it is built, possesses advantages, up to a certain point, for health and cleanliness, not surpassed by any city in the world. It is provided by nature with a complete and

efficient subterranean drain, ready at any and every point, wherever a well may be made to penetrate it, to receive the waters which are used to wash away its *effete* products, and to conduct them and the matters with which they are charged to the nearest outlets at tide level. Flowing at a depth below the influence of the sun, they are maintained at a temperature so low as to preclude decomposition and the generation of gases until they have issued into the harbor, where they accumulate and stagnate in the heat and drought of summer.

"The testimony of those whose occupation it is to make perforations for sinks and wells all over the city, and of those who have dug foundations and dredged out docks along the water front, establishes the fact that at about twenty feet below tide level, extending under the harbor and the city, there is a thick stratum of clay, through which no water can find its way downwards, and through which all lower water will rise wherever wells are bored deep enough to reach those veins. That upon this bed of clay there rests a stratum of very coarse gravel, overlaid, in the higher parts of the city, with a heavy deposit of sand. That all of this deposit of gravel and sand is thoroughly pervious to water, which, arrested by the clay, flows through the gravel at the bottom in innumerable and copious streams. And that the tide rises and falls over a large district of this subterranean water, as can be observed in many of the wells in the lower part of the city, many squares from the Basin or Falls.

"Taking advantage of these conditions, the citizens of Baltimore have long been in the habit of getting rid of all *effete* matters without effort or thought; after once establishing a well which communicated with the underlying porous strata. With so much facility and obscurity has this object been accomplished, that consequences were no more thought of than if they had been cast into the middle of the ocean. Even the Health Commissioner, who presides over the department, whose duties require a study of such questions, would only recognize that they passed off in subterranean streams to unknown regions, and ignored the fact that the harbor of Baltimore was the final receptacle of the contents of the ever-

replenished sinks. And most of those whose attention has been called to this fact, could not divest themselves of a conviction, that this subterranean conduit had a mysterious power of annulling the laws of chemistry, and of converting all the elements of an offensive decomposition into pure water.

"Upon the hypothesis that this enormous mass of corruption supplied by many thousands of these wells, had gone out of existence, the most strained chemical theories were invented to account for the annual exhalations of offensive gases from the harbor. But the history of science proves that whenever a remarkable phenomenon is observed, the cause of which is entirely unknown, scientific men will always invent a cause and uphold their theory with the most scientific reasoning, until new light forces them to abandon it in favor of either the true cause or a more plausible one. Influenced by the reports of the chemists, who contradicted each other, and who contradicted themselves in different reports in their endeavors to draw a correct conclusion from mistaken premises; and by the opinions of sea-captains, whose experience taught them that bilge water in the hold of a vessel, charged with the molasses which drips from a cargo of sugar during a voyage from the tropics, amounting sometimes to ten per cent. of the weight, gave out an odor similar to that of the Basin in summer, public opinion fixed upon the operations of the Calvert Refinery as being the principal cause of the condition of the harbor. This establishment had the misfortune to be situated at a point where Jones' Falls, after penetrating the most populous sections of the city, and collecting from the sewers and porous strata of all that region their polluted discharges, concentrates them in a stagnant pool called the City Dock, to be acted upon by the summer's heat. The condition of this dock and of the water of the harbor at its outlet, enveloping the refinery with its fumes, led the imagination to assign their origin to that building; notwithstanding the fact that the water immediately at the point of the discharge of the waste-fluids was comparatively free from these manifestations. The justice of this accusation is only equaled by that of the wolf, who accused the lamb of disturbing the stream at a point

above where he stood. And this charge was insisted upon, although any one with eyes and a nose could perceive the generation of the black and seething fluids at Baltimore street and far above, and their flowing in a perpetual current towards the refinery. And with equal distinctness at Schroeder's Run, in proportionate quantity, flowing into the Spring Gardens—a locality remote and isolated from all refineries or other factories. And notwithstanding that indisputable documents were on record to prove that the same evil was loudly complained of before the refineries were started.

"Upon the disappearance of the odors last summer, coinciding with the restrictions laid upon the Calvert Refinery, and also coinciding with frequent and heavy showers of rain; which latter coincidence the editors, steamboat-men and chemists completely ignored; public opinion under their guidance was satisfied that the refining of sugar had been the true cause of all the evil. The editors collected the testimony of the habitues of the wharves to the effect that the cure was complete, and the chemists maintained that their theory was confirmed. But when the rain ceased and an unbroken drought prevailed for three weeks (which had always been a necessary condition of the development of the gases), the local columns of the papers commenced to record the offensiveness of the air and the blackness of the water, and in a few days the evil manifested itself in all its accustomed force; notwithstanding that the gates of Lake Roland were opened, postponing the effects for a few days, but giving rise to a water panic. Thus were all of their expectations falsified. And refusing to give credit to the rain, as they did in the summer of 1876, they were driven to the absurd conclusion, that the refineries must have suspended operations during the month of clear water and pure air last summer as they did during the summer of 1876.

"At this time the Mayor had made a visit to Newport, and having occasion to observe the effects of a sewer emptying into the harbor there, returned impressed with the fact that sugar refining was far from being responsible for all the subject of complaint. He might have read the Sanitary re-

ports of some of the largest cities in Europe and in this country, particularly London, where he would have seen described precisely the same effects that are so noticeable in Baltimore, and to the same or greater extent, and all ascribed without a question to the same cause as that existing at Newport. He has since recommended the construction of the intercepting sewer which had been projected some time before, which shows that he was at least moving in the right direction. And had he remained in office two more years he probably might have gotten down to the true source of nearly all the offence. But he and his advisers would have had to penetrate with their investigations to a depth of twenty feet below the level of tide. They would have had to recognize the fact that at that point there was a thick stratum of impervious clay extending under nearly the whole of the city and harbor, and that upon this rested a stratum of coarse gravel through which the water percolated with facility, carrying with it all matters held in solution or suspension, and that about forty thousand sinks discharge their contents continually into it, and that there was no possible outlets for these fluids except into the harbor; either directly or by way of such streams as Jones' Falls, Shroeder's Run and Harford Run.

"If the intercepting sewer is built, as it has been designed, the great expenditure will be made without abating the nuisance to an extent that will be appreciable. It may carry off the comparatively innocent fluids flowing in the gutters and the contents of the sewers in its neighborhood; but what is to become of the enormous product of the sinks which will continue to increase in number and efficiency every year, and of the many sewers that will be required in some of the northern sections, and which must discharge into Jones' Falls? It cannot be expected that the people of Baltimore will throw away the great boon which nature has conferred upon them, by filling up their wells, and, abandoning their natural drain, substitute a net work of sewers over the whole city, at an enormous and ruinous expense, which, in consequence of its being subject to the heat of the surface and its numerous vent holes, will become a vast generation of nox-

ious gases, far more dangerous than those escaping from the Basin. They will construct sewers only where wells cannot be made to act, and discharge them by the shortest route into the Falls.

"Although nature has done so much for the covenience, cleanliness and health of Baltimore, she has left something for the citizens to do for themselves. They must supplement her plan if they wish to abolish that scourge to the senses which at every dry period in summer forbids the stranger to stop over night, and threatens to drive away the most desirable class of residents. But what can be done? is the question asked by many who despair of any relief. To answer this question is the object of this paper.

"If it is established, as stated from the testimony of those mechanics who have dug wells and foundations at innumerable points in the city, that the water which pervades the underlying gravel does not penetrate the clay upon which it rests, then a dike or wall of clay, erected upon this floor of clay, connecting with it at the bottom and rising above the level of tide, will prevent such water from passing beyond, and compel it to seek an outlet at the nearest point where this wall does not intervene. Therefore, if a trench, beginning at the base of Federal Hill and extending along Light street and Pratt street to the Falls, were dug down to the clay bed and then the trench filled up with impervious clay, the foul waters, percolating through the gravel, would be prevented from passing into the Basin. They would seek the nearest outlet into Jones' Falls above Pratt street. Communication by percolation might still be open to the harbor below Federal Hill, or to the more distant Spring Gardens; but the resistance offered by such longer distances would determine the great bulk to issue at the nearer points along the Falls, especially if the head were constantly drawn down by an artificial current emptying that stream. The more this dike of clay is extended along the harbor margin the more perfectly will it be intercepted and diverted into the Falls. But carried out to the extent just mentioned, it would cause the whole of the fluids, which have been the cause of the nuisance, to issue into the bed of the Falls, where the greater

part of them have always gone. This stream must necessarily, for all time, be the great conduit for the surface and subterranean drainage of, by far, the largest and most populous part of the city, and will drain all its future extensions towards the north.

"Having forced all the foul waters into this one receptacle, and having shut it off from the harbor by a gate, so constructed as to fall and lie upon the bottom when all the waterway might be required by a flood, or when it was necessary to admit a boat; it would then be necessary to construct a conduit from above this gate and connecting with the Falls, to the broad and moving waters of the Patapsco beyond the quarantine line, giving it a capacity and establishing a flow sufficient to carry off the volume of the Falls, at its low stages during droughts; thus depriving it of the opportunity to become foetid by stagnation and heat.

"This volume will never reach the capacity of the conduit from the Gunpowder River. A large portion of the supplies derived from the Gunpowder and Lake Roland will flow directly in the harbor and the Middle Branch, and another large portion will be evaporated upon the streets and pavements. The water which falls in rain and snow, washing off the dust of the streets and flushing the gutters on the surface and swelling the volume of the Falls beyond the capacity of the diversion conduit, would flow into the harbor with no worse consequence than a temporary turgidness, as it would transport so few substances capable of offensive decomposition.

"But as we have to go below the level of tide in order to intercept the waters to be removed, we cannot expect the force of gravitation to do the work of transportation unless the external pressure of tide water at the outlet of the conduit is removed by steam or other power. This would entail but a small expense and need be used but for a short time each year.

"When the new supply from the Gunpowder is introduced it will flow through a circular conduit whose traverse area is 113 square feet, and with a descent of one foot in 5,000,

causing it to flow at the rate of about 125 feet per minute. Now the power applied by gravitation to cause such a column of water 5,000 feet long to move at this rate is the same which an engine and propeller would be required to apply in lifting 113 cubic feet of water, or 7,000 pounds, 125 feet per minute, or 875,000 pounds, one foot per minute. And as one horse power is the raising of 33,000 pounds one foot per minute, the engine and propeller would have to apply the power of $26\frac{1}{2}$ horses. If the column of water was 20,000 feet long on the same inclination, 105 horses would represent the power applied by gravitation. Therefore an engine which would apply a power of 105 horses to the removal of the pressure of tide-water at the outlet of the conduit of this capacity and inclination, connecting Jones' Falls at Pratt street with the Patapsco beyond the Lazaretto, would cause the same quantity of water to be discharged as that which will flow naturally through the tunnel of the Gunpowder supply. Which is to say, that a 150 horse engine driving a propeller-wheel in this conduit at its outlet, will cause to be discharged beyond the Lazaretto, all the contaminated water which gives rise to the discoloration of the harbor and the offensiveness of the air when the city has reached its utmost anticipated population. If it were not for the objection of causing wet cellars in the very low districts, and that of forcing some of the foul water to issue where there was no intercepting dike of clay, the engine and wheel could be dispensed with by maintaining a head of four feet above tide in Jones' Falls above Pratt street.

"Such a conduit would not require to be built in the expensive manner of an ordinary sewer; which, generally resting upon the upper strata of yielding and uncertain character, requires masses of masonry for its foundation to insure it against fracture; and being above the level of permanent water, must necessarily be hermetically sealed with cement to prevent its contents from escaping into the adjoining soil or rising to the surface. But founded upon the firm stratum at a depth of ten or fifteen feet below tide-level, and constantly submerged, it will require only two parallel walls of large stone masonry, without mortar, surmounted with a semi-circular arch of

rough stone or brick. These walls should be pervious to water in order that the polluted under-drainage of the south-eastern section of the city, including Canton, which will become more populous and sanitary as time advances, may find its way into the conduit to be discharged with the rest at the outlet. It would also be necessary to continue the clay dike from the Falls at Pratt street along the lower side of the conduit so as to prevent the foul water from issuing into the harbor, and that of the harbor from being drawn into the conduit to the partial exclusion of that desired to be removed.

"If the city continues to grow and the western sections become populous, it is only a question of time when the Spring Gardens and the Middle Branch will present the same conditions as that of the basin and harbor at present. When that time arrives the same remedy can be applied of interception and diversion, either by discharging at Ferry Bar or connecting with Jones' Falls.

"Such in brief is the outline for a plan for intercepting the whole of those matters of the present and the future which are the cause of the pollution of the harbor and the atmosphere. It contemplates the general use of sinks to be made efficient by depth of penetration and the avoidance of all sewers except where these are impracticable. That such a practice is consistent with the highest degree of health, the renown which Baltimore has heretofore had for cleanliness and salubrity is sufficient proof. And the large amount of water which can be commanded at all elevations will render it the most convenient and sanitary for the whole population.

"Nearly all the elements for calculating the cost of such an improvement can be obtained by borings and other investigations. But enough is now known to warrant the assumption that the cost will be less than that estimated for the proposed intercepting sewer, and will not much exceed that of the perfectly useless temporary supply.

"This plan requiring the expenditure of three-quarters of a million, is predicated upon the present absence of renovating supplies of fresh water during the droughts of summer, or in contemplation of the future expansion of the city, when its

increased population will proportionately aggravate the causes of the evil and the necessity of a remedy—a time when a larger portion of the water to be derived from works now in progress will be applied to domestic uses. But, as we have seen so often, the nuisance mitigated by a few showers of rain and entirely abated by a continued and heavy rainfall, as happened in 1875 while the refineries were in extensive operation, although financially suspended, and in 1876, aided by the removal of a year's accumulation of foul deposits, and, as happened last summer, after the heavy rains which succeeded the orders of the Health Commissioner to the Calvert Refinery, and as was witnessed after the drought of last summer, the postponement of the revival of the nuisance for several days, simply by the general flushing of the sewers from the meagre supply of Lake Roland, there is ground for the hope that the daily flow of one hundred and fifty superfluous millions, which will be available when the new works are complete, will have the effect of preventing the Basin from reaching that degree of pollution which causes so much complaint. If that much water had been at hand last summer instead of the petty store of Lake Roland, it is almost certain that those holding to the sugar refining theory would have had it in their power to seemingly maintain their position by keeping down the odors after the Health Commissioner's injunction to the Calvert Refinery—for in a week the rains came to their relief.

"It is only at periods of prolonged drought, such as occurred in 1874, when the Gunpowder river itself will be reduced to a volume less than half of the capacity of its conduit to the city, or when the city has become much more populous, that the plan here proposed, or one accomplishing the result in view, would be demanded by the taxpayers.

"At the present time, when taxation has become so onerous, economy will dictate the postponement of all heavy expenditures on account of the Basin evil, until the extent of the relief to be afforded by the new water supply is experienced and its efficiency tested. When other measures are imperatively demanded by the great majority of the citizens, it is probable that their numbers and the taxable basis will have much increased.

"It will not require any special arrangements or extraordinary outlay in order to take full advantage of the surplus water of the new works in renovating that of the Basin and Falls. There is no need of its being made to rush in under a head, creating a local stirring up, or of admitting it at very many points. The more quietly it is admitted the better; the only thing requisite being quantity. It would be impossible with any quantity attainable to cause a current in the broad expanse of the Basin sufficient to carry off solid matters stirred up at the bottom by the force of water emitted from pipes under pressure. They would all be deposited at a short distance from the point of disturbance. But the water itself, charged as it is with the elements of the foul gases in solution and very fine suspension, being gently pressed outward and replaced by pure water, will become so scattered and adulterated by that of the harbor as to rapidly diminish the development of odors. Therefore if the water is admitted by way of the street gutters and the sewers which now empty into the Basin the object will be accomplished.

"But the bed of Jones' Falls is the receptacle of by far the larger portion of these impurities; which, being a long and contracted channel, need only have the fresh water admitted at the nearest and most convenient point to the outlet of the new reservoir at Montibello. It would find its way just as well by a ravine as by a pipe, and would be just as serviceable for all purposes of flushing and renovating."

These views of Mr. Randolph are well worthy the attention of the municipal authorities. They intelligently point out a ready and practical mode of getting rid of a great and increasing evil. So far as they relate to the offensive stench of the Basin, during the summer months, I am not prepared to adopt them, though I do not deny their correctness. It is not my purpose to discuss the subject of the Basin at this time, inasmuch as I have not deemed it absolutely one of the local causes of the city's insanitation. The matter, however, attracts a great deal of attention, and is looked on as a vital one by many of our citizens. This interest will increase from year to year, and, therefore, any investigation that serves to

throw light on the subject cannot fail to prove a boon to the community. The authorities of the city of Baltimore must be aroused in some way to a sense of the importance of their duties in connection with the health and lives of the people. Judging from their past indifference and neglect, it would appear that nothing save a visitation from Heaven, in the shape of some fearful scourge, will prove sufficient to awaken them to a knowledge of their responsibilities.

HARRIS CREEK AND JONES' FALLS.

The first of these streams, if so turbid and tideless a water course can be called a stream, is the greatest nuisance in the city, and, in my judgment, is a prolific source of disease. It is the receptacle of all the vegetable and animal debris of the eastern portion of Baltimore, including the refuse of the slaughter houses on Loudenslager's Hill. As long as it is suffered to remain in its present condition, it must necessarily be a factor in the production of local diseases.

Jones' Falls is not so narrow and sluggish as Harris' Creek, but at certain seasons of the year, and under certain conditions, does give rise to diseases of a malarial character. I have, as a medical man, watched for more than thirty years the origin and spread of epidemics in Baltimore, and I have always thought I could trace out an influence arising from Jones' Falls—a wave of disease, so to speak, adding to, if not producing, the original trouble. The improvements at present being made on this stream, expensive as they are in character, may add to the security of property in the vicinity, but will prove of very little service in a sanitary point of view. An open bed like Jones' Falls for the sewerage of a city cannot fail to be unwholesome. Central avenue, formerly Canal street, was many years ago an open run. Intermittent and remittent fevers of a very serious nature prevailed every year along its course. Since the filling up of the street and the erection of the sewer these diseases have almost entirely disappeared. At the time to which I allude, animal refuse did not form a part in any large degree of the decaying matter, and, consequently, typhoid fever was not common. (It may be

added, however, that the sewer or culvert that has been built to take the place of the open run on Central avenue is inadequate, and not at all adapted to the purpose for which it was constructed.)

Doctor Thomas H. Buckler always contended that Jones' Falls is the source of the malarious diseases prevailing in the lower portion of the city, and in his last *brochure*, written before his departure for Europe, he advocated the theory that the gases of the Basin are rendered innocuous by the counteracting and antagonizing influence of the malarial poison arising from the bed of this stream. Be this as it may, the Falls will always be looked on with apprehension by medical men. The great expenditure now being made for its improvement is made entirely without reference to the health of the people, and in that view must be considered as money recklessly thrown away.

PRIVIES AND CESS POOLS.

The privy system of Baltimore is perhaps as bad as that of any city in the United States. It is a memento of the past, the well-preserved and filthy relic of a village history. The existence of forty or fifty thousand of small superficial holes, denominated privies, a few feet in depth, poisoning the atmosphere with their putrid gases, is not a boon to a great city; and yet the citizens of Baltimore appear to cherish this peculiar institution with as much pride as they do their monuments and the memories of their brave men and fair women. These privies are no doubt the most positive and prominent of all known factors in the production of local diseases in Baltimore. The gases, alone, would account for much of the sickness found to prevail at certain seasons; but apart from this, owing to the proximity, in many instances, of the out-door hydrants so commonly in use, the water, otherwise pure and wholesome, is rendered unfit for use, and is the source of zymotic disease. My attention was drawn to this evil, some years ago, by the circumstance that I was called on to treat a whole family of patients, suffering from typhoid fever, in a small tenement in the neighborhood of Belair market. On an examination of

the premises, I discovered an overflowing privy within a few feet of the hydrant. I could not, at the time, understand how the poisonous excrement could find its way into the water of the hydrant, though I felt convinced it was the cause of the severe malady that had prostrated a whole family. Mentioning the subject in one of the medical societies of the city, my friend, Doctor Erich, in the course of the discussion, stated that his attention had been called to this matter by a similar experience, and that he had investigated the subject, and believed he had discovered the modus by which poisonous gases and morbid material contaminated the water consumed by thousands of the people of Baltimore. At my request, the Doctor has kindly furnished me the explanation which I subjoin; it is a plain and clear statement, and will, no doubt, claim the attention which it merits.

"In compliance with your request, I have the pleasure of furnishing you a short summary of the results of my investigations in reference to the pollution of hydrant water by local causes.

"My attention was first directed to the subject by a lady to whom I had pointed out the dangers of using pump water. She assured me that she had frequently drawn earth worms, hair and sand from the hydrant in her yard, and proved her statement by actual demonstration. After an examination of the mechanism of the 'non-freezing hydrants,' such as are found in the yards attached to dwellings, I am convinced that they are all liable to admit impurities after they have been in use for some time. They are provided with vacuum chambers for the purpose of drawing or 'sucking' the water contained in the pipes after each discharge under ground, below the freezing point. This action, being frequently repeated, causes the plunger, as well as the leather or rubber packing surrounding it, to wear and become leaky. The vacuum chamber, being constantly immersed in stagnant water, derived from the gutter in front of the hydrant, and in some instances from adjoining privies, a portion of this filth is sucked in when ever the hydrant is turned off, and is then discharged with the water the next time the hydrant is turned on.

"The correctness of this statement may be readily verified by emptying a bottle of the ordinary washing blue into the top of the box surrounding the hydrant, when, after a few forward and backward turns of the crank, we will have its presence in the water plainly apparent to the eye. I would venture the opinion that not less than nine out of every ten of the hydrants in use will be thus found to be leaky. As a remedy I would suggest the abolishment of 'non-freezing' and the general adoption of in-door hydrants."

The true remedy, however, to obviate the whole trouble, is to dig down low enough in the construction of privies, if these cloacæ are still to be retained, to prevent superficial drainage as well as the generation of noxious gases.

WATER CLOSETS.

The water closets in many of the private houses and some of the small hotels, particularly those erected some years ago, are very defective in construction. This fact is made apparent to medical men in attendance on the families residing in these houses and hotels by the presence, at times, of offensive gases. This is particularly the case in those houses, not a few of which are to be found in the city, in which the closets are placed in the very centre of the building. These are not lighted or ventilated. A number of cases of typhoid fever, among the better class, have had their origin from defective traps and overlooked leakages in these closets. The wells into which they empty are entirely too superficial, as has been before pointed out, and the whole system of their construction bad and insanitary. These closets, in my judgment, play an important part in producing infantile diseases in the families of the wealthy.

KITCHEN DRAINAGE.

The drainage from the kitchens in Baltimore is not carried off to the gutters by pipes, but flows most commonly over a large space of intermediate ground, permeating the soil through the interstices between the bricks, where it remains covered and hidden to be acted on alternately by the rain and sun. The offensiveness of these accumulations when the bricks

are moved can scarcely be conceived, a fact that I discovered on making some repairs in my own yard. How far this condition of things is prejudicial to the health of the city I am not prepared to say, but it certainly is an evil that should be corrected.

CELLARS.

No cellars in the world can be constructed in a worse manner than those of Baltimore The pre-requisites for a good cellar, cleanliness, dryness, light and ventilation, are almost entirely wanting. Not one thousand of the eighty thousand cellars of Baltimore, I will venture to say, possess these qualities so indispensable to health. Owing to the peculiar nature of our subsoil, heretofore described, they become the receptacles of noxious gases which course through the houses, permeating and contaminating carpets, beds, clothing, &c. In tracing out the local causes of typhoid fever in the families which I have been called on to attend (and I always endeavor to seek out a local cause) I have been compelled in the majority of instances to attribute it to the condition of the cellars, and, therefore, I am convinced they play a greater part in producing the insanitation of the city than drainage, sewerage, or many of the other causes which are supposed to produce the diseases of large towns. During the past year a slight outbreak of typhoid fever which took place in several of the tenement houses on President street, near Eastern avenue, was due, in my judgment, to the foul condition of the cellars and outbuildings. I was compelled to report twice to the Health Department before the landlord would do his duty in the premises, and then it was done with the utmost reluctance. Three cases of typhoid fever, one of them fatal, occurred in the house adjoining my own on Franklin street, from the same cause, during the previous year. No part of a dwelling requires so much care in its construction, and, after construction, in its sanitary supervision, as the cellar; and yet not the slightest attention is exercised in the matter. I venture the assertion, that if all the cellars of Baltimore were examined at this moment, not one in one hundred would be found free from causes, which, under certain conditions, would be likely

to generate disease. When the Inspector of Buildings is a man possessing some sanitary knowledge, and it is made his duty to reject buildings not built in accordance with known health laws; and when the sanitary inspectors, that is, the vaccine physicians, are properly paid and do their whole duty under the law, and, further, when the police are made conservators of the public health, this will not be the case, and thus one of our most potent, if not the most potent, of our sanitary evils will be forever removed.

IRON FLATS.

Another source of mischief, the more dangerous because overlooked and insidious, is the existence of the iron flats covering the gutters introduced into our city during the past few years. These flats, owing to their peculiar construction, become the centres of contagion—they catch and hold to the exposure of the sun a portion of the vegetable and animal debris intended to pass through them, and thus become sources of disease. My attention has been particularly directed to one of these nuisances on Franklin street, corner of Larew's alley, the stench from which during the past summer drove the neighbors to the country weeks before the usual time, and which is believed by some persons living in the vicinity to have engendered typhoid fever in the neighborhood, no less than five persons dying in one house in Larew's alley.

OYSTER SHELLS.

An additional cause of sickness of a typhoid character is the presence of large collections of oyster shells which are suffered to remain and decay at different points in the eastern part of the city. My friend, Doctor Arnold, reports to me that he treated seven cases of typhoid fever in Philpot alley during the past year, due, in his judgment, to this cause. The proprietors of the oyster packing establishments in the city and suburbs should be compelled to remove the shells and refuse on their premises daily.

FILLING UP LOTS AND STREETS WITH REFUSE.

A very objectionable practice, highly detrimental to public health, has prevailed in Baltimore during past years, viz.: the filling up lots and the beds of streets with garbage and refuse. This is an evil that must be permanent, for the processes of decay are ever going on, provided the necessary elements of heat and moisture are brought into action. I do not know that at the present time this practice is allowed to continue, but certain portions of the city, markedly those of north Charles street beyond the bridge and the northeast end of Washington street, were filled up in the manner indicated. These accumulations may prove innocuous for years, when suddenly, if a spark of contagion is allowed to fall into them, a fearful outbreak of disease is sure to occur. This was the case at Norfolk and Portsmouth in 1855. The accumulations of chips and shavings and other debris at the navy yard were suffered to remain for years without evil results, when a ship from South America communicated the spark which lighted up the fearful outbreak of yellow fever that decimated those two cities. Lots that have been filled up in the manner described are now built over, and may, in the end, prove a serious scourge to a whole community. Even if not productive of sickness, they are unsightly and unpleasant frequently to the senses.

DRINKING WATER.

The drinking water of Baltimore is as pure as possible, and no portion of the disease of the city can rightfully be attributed to it, when not exposed to contamination. The wells formerly used have been to a great extent abolished and their places supplied by public hydrants and fountains. In the eastern part of the city, in the vicinity of Thames street, owing to the want of public fountains, the abandonment of the old wells has not unfortunately taken place, and they are still largely used. It was believed that after the startling analysis of the character of the water of these wells made by Professor Tonry the authorities would take some action looking to their abolition, but, so far, nothing has been done. The

physicians practicing in the neighborhood believe them to be necessarily dangerous to the public health, and the Health Commissioner of the city, in his report, expresses the same judgment and earnestly urges their condemnation. One or two fountains in other portions of the city supplied by springs are used by wayfarers, but not so constantly as to give rise to apprehensions from their use. One of them, quite near me on Calvert street, below Franklin, is saturated no doubt with organic matter, but it is not much used by the neighbors. Twelve liquor saloons in the same block are necessary, however, to protect strangers from its noxious influences.

PREVALENCE OF DIPHTHERIA AND SCARLATINA.

The prevalence of diphtheria and scarlatina to an unusual degree in the southern and southwestern portions of Baltimore has been before alluded to. To discover a reason for this fact it is only necessary to examine the filthy stream running from Cross street to the Spring Gardens, as well as the condition of the intervening ground between these points. If Doctor Snow is right in stating (and I believe he is undoubtedly so) that diphtheria is preëminently a filth disease, and that it occurs most frequently, and in the most malignant and fatal form, where dampness and filth do most prevail, then no spot in the whole world could be better selected for the propagation of this disease than this part of our good city. Another factor has, however, been added during the past year to its already existing foulness. I am assured, on reliable authority, that large quantities of night soil have been dumped into the Patapsco at this tideless point, without the knowledge of the health authorities. The excrement could at times be seen floating on the lazy stream, proving offensive to those living in the neighborhood, and adding to the noxiousness of the surroundings. Our Health Commissioner, Doctor Steuart, in his last report, called attention to the noisome state of the Cross street stream, but he was not aware, of course, of this additional element of danger to the citizens of South Baltimore. How much longer this section of the city is to be neglected rests alone with the people themselves. Unfortu-

nately, owing to their ignorance of sanitary laws, they are unconscious of the many dangers that surround them.

SANITARY INSPECTORS.

The law in relation to the inspection of the houses of the people of Baltimore is as perfect as possible. The only difficulty is, it is not enforced. Under its provisions the police and the vaccine physicians are made the custodians of the public health. The vaccine physicians are required to visit and examine every house in their respective districts, and to report on their sanitary condition. Were this statute properly enforced, and a conscientious and thorough examination made of all the houses, cellars and outbuildings, including the hydrant in the yard, typhoid fever would become a rare disease.

The police can only be agents in a very rude way to carry out sanitary laws. They have not the special knowledge which the vaccine physician is presumed to possess; but they have noses, and eyes, and common sense, and, from the possession of these, can be of great service in discovering insanitary conditions. They can also see that health laws are executed faithfully.

The present sanitary inspectors, though respectable and excellent men, are a heritage of a system of village insanitation, and are utterly useless as far as the prevention of disease is concerned, and, moreover, completely inefficient, owing to their entire ignorance of sanitary science, to remedy existing evils, to which their attention may be drawn. They are appointed solely for political reasons, and possess about as much knowledge of hygiene as they do of the Pandects. They search out nothing, investigate nothing, unless directed to do so. In a word, they are a heritage of a bad system, having its origin and growth in political patronage—an evil which should never be suffered to affect the health and lives of a community.

Let it once be understood that every case of typhoid fever has a local cause, that some one is responsible for it, that some public functionary is to blame, and then the trouble will cease.

CONCLUSION.

In the foregoing observations I have endeavored to point out a portion, perhaps the most prominent portion, of the obstacles to the perfect healthfulness of the city of Baltimore. Were these removed, and a complete system of sanitary rules enforced, I am convinced, as I have stated in the beginning, that Baltimore would become one of the healthiest, if not *the* healthiest, of the cities of the world. To secure this, however, it is important that the executive officers of the city connected with its improvements should all be men versed in sanitary science. The Commissioner of Public Works, in addition to being a civil engineer, should be a sanitary engineer. The Inspector of Buildings should also be a man possessing sanitary knowledge. The Sanitary Inspectors should be competent medical men, particularly versed in matters pertaining to the laws of health.

Let men of this character be appointed to these places, and rigid sanitary laws be enacted (the Councils in the meantime doing their duty), and, as sure as anything in the future can be predicted, Baltimore will surpass even the inland towns of the West in salubrity, and exhibit to the world the lowest possible death rate attainable in a great city.

THE PUBLIC

INSTITUTIONS OF ALLEGANY CO.

By C. H. OHR, M. D.

CUMBERLAND, MD.

THE PUBLIC

INSTITUTIONS OF ALLEGANY CO.

The Public Institutions of Allegany County.

Self-preservation is a law of nature implanted in every rational being when created, and the rights and powers implied by it are peculiarly applicable to man in a state of *individuality*. "The safety of the people is the supreme law," is a maxim consequent on the first in its application to men composing societies or communities. At the foundation of our form of government, as the corner-stone on which it was erected, stands forth the principle, that first among the inalienable rights of man are the possession of *life*, of *liberty*, and the pursuit of *happiness*. The enactment of laws should have these as their primary objects.

The first of these is the possession of life. 'Tis not all of life "*to breathe*," but to possess and exercise all the faculties and powers of mind and body which constitute the life of man. To have and exercise these faculties and powers, it is essential that every individual element of both mind and body should move with ease and in harmony; and to this end air, exercise, food and light are important factors. It is not, however, proposed in this paper to discuss these factors in all their details, but aphoristically.

First, then, in order and importance, of air. For animal life and vigor, it should be pure and free as it came from the hands of the Creator, that it may subserve the purposes for which it was designed. Secondly, of exercise. The necessity of this factor was manifested in the earliest days of our race, when it was said, "in the sweat of thy face shalt thou eat bread, until thou return to the ground." This was not, as too generally considered, a mere *curse*, but as a knowledge of the construction of our frame, as history and observation demonstrate a necessity of our organism. A short digression will serve to illustrate this point. It is a well known fact, of almost daily observation in cases of broken limbs

kept in a state of immobility, that they become smaller and weaker than their fellows which are allowed freedom of motion. Capt. Speke, in his African Travels, relates a custom of certain natives being kept in a state of quietude and crammed with milk who became helpless from fat.—Degeneration is the result in both cases—*from the want of exercise.*

Thirdly, of light. This factor, although not attracting much attention in systematic works on hygiene or sanitary science, is not less important in its effects on the human system than air and exercise. The extent of the power and mode and action of light upon both organic and inorganic bodies is insufficiently understood and less appreciated, although its effects are palpable and not to be mistaken. Its effects can be easily illustrated in a familiar way, though not demonstrated. A clear solution of nitrate of silver protected from air is darkened by light and casts down a black precipitate. Powdered rhubarb and male fern root are changed in color and power by the action of light. A more familiar instance of the action of this factor on vegetable life is seen in celery. Exposed to air and light it grows green, vigorous and tough; deprived of light by being buried in earth it becomes pale and tender. So is its action on the human system, for when deprived of the action of light it becomes pale and soft.

Fourth, of food. This factor embraces not merely what we eat, but to a greater or less degree embodies in its range drinks, clothing, air, light and heat. Man is by nature omnivorous in contradistinction to other sections of animal nature, part of which is characterized as carnivorous or flesh-eating, another part as graminivorous or grain-eating. He partakes of both natures and requires for the healthful development of his organism and functions both kinds of food.

The office of sanitary science or the regulation of public health must have reference to the quality and quantity of air, to the amount of exercise, as work or play; the nature and quantity of light; the quality and quantity of food, as meats, vegetables, drinks, clothing and heat. In proportion

to the proper regulation of these matters will be the health of the individual, the energy and enterprise of the community, the power, prosperity and glory of the State. The extent of crime and pauperism attributable to the neglect and want of attention to these things is not a matter of imagination, but a serious burden to our communities or counties, and a drawback on the character and prosperity of the State. A wise political economy and a proper regard for the safety of the people would seem to demand some legislative steps to protect the public and private health against geographical or national and social causes of disease and deterioration. If, under forms of government where the people are secondary and the monarchy and its satellites are the primary objects of consideration, the effects of disease and deterioration have so sapped the health and vigor of the productive and defensive class as to call for and produce legislative action for the protection of public health, how much more appropriate and obligatory in a country where the sovereignty is proclaimed to be in the people, and the governing and legislative establishments are set up as the agents and servants of the people, is the duty of such legislation? In proportion to the productive energy and vitality of a nation is its power and prosperity, and these are dependent on the health and strength of its people.

This fact has long been measurably recognized by many of the European governments, and legislation directed towards its accomplishment. But more recently, and especially in Great Britain, has the subject of hygiene attracted greater attention and caused more effective legislation in relation to geographical or material causes of disease. The social causes are less under the power and control of, and can be reached only partially and indirectly by, legislation, especially under forms of popular government. The impulse, however, to this reform, and the foundation for it, is within the reach and power of the legislature. In the list of social causes of deterioration and disease may be named as most prominent, intemperance, immorality, injudicious marriages, overwork, idleness and excesses of all descriptions. These are to be

reached and mitigated mainly by education, the great instrumentalities of which are the church and the school. Legislation can reach the schools, and by a proper regulation of them can do much to mitigate the social causes of disease and death.

In recent times, physiology, or the science of the healthy action of the human organism, has been added to the subjects of common education; a very important addition but susceptible of greater usefulness. A far more important one should be added, namely—hygiene, or the laws of sanitary conditions, public and private. If the rising generation be taught a knowledge as to what is the healthy condition of their systems, and also of the things requisite to preserve that healthful condition, they will to a certain extent put into practice the precepts they have been taught. The lessons of childhood become more or less the laws of later life, as their practice and utility demonstrate their profit and importance. The social status becomes improved just as the acorn becomes an oak. Man, though frequently morally blind, is not always wilfully so, and needs only to be taught the causes and sources of the evils that afflict him to avoid and abate them, and in this way legislation can do much to remove the social causes of disease and degradation.

The prevention and abatement of the material causes of disease is within the scope of the legislature. Maryland has taken initiatory steps in this direction, as have some of her sister States, some of which are considerably in advance of her. The Public Health Acts of Great Britain might be consulted with great profit and serve as a guide to useful legislation. They provide for a general board with local boards, which are empowered to enact regulations and enforce them. Maryland has a general board—but no local boards—without power to make and enforce regulations, and consequently its usefulness and efficiency are very limited. It possesses only such moral power as can be exercised by the influence it can exert on public opinion, and this is something recently evidenced by a report made by Dr. Chancellor,

the Secretary of the State Board of Health, to his excellency, the Governor of the State.

As human nature and human action do not widely differ in different localities of a given community, it is proposed in this article to view through Allegany county "spectacles" some of the wrongs perpetrated against hygiene and humanity through the instrumentality of public institutions. The writer of this paper having served two years as Trustee of the Almshouse of Allegany county, may be presumed to have tolerably good knowledge of the fairness of Dr. Chancellor's report. From the knowledge obtained by frequent and personal observation, the writer must say that the picture was not overdrawn but *otherwise*. The normal condition of the house was not that of cleanliness, the outside surroundings offering no disparagement to the interior. The inmates' rooms were generally large, constructed with a view to crowding and general saving of fuel, labor and expense. Ventilation and health were not factors in the architectural design. The house is built on the slope of a considerable hill, and near its base, with the basement and floor immediately above, under the natural level of the ground. It was probably thus located because, when the property was acquired by the county, an old log-house or cabin stood there and was used as the poor-house until the progress of time and decay caused the present structure to take its place. In its construction the means of ventilation were entirely ignored, and cleanliness was not considered a matter of convenience. The offices, if such things may be said to exist, are a burlesque upon the term. Old, tumble-down board shanties, traps for limb or life, constitute the offices and quarters for the colored inmates. The dining-room adjoined the kitchen, and in cold weather was loafers' hall, where congregated such of the inmates as were not confined to their rooms; men, women and children, without regard to conditions of sanity, insanity or color; peacefulness or violence. The bedding for *lightness* and *shortness* would have been no bad competitor with the best French pastry. The dietary contained no superfluities and gave no vexation from variety, while it de-

manded promptness of devotion and inflicted penance upon laggards. No partiality was shown to the well or to the sick. Butter, eggs, milk, chickens and similar light food were not permitted to take the place of the more solid shoulder of bacon, cabbage, molasses and baker's bread; dyspeptics and eupeptics, obesity and inanity were all placed on the same level without the intervention of a diet-table.

The labor of the farm was hired, the products of the dairy and poultry-yard were economized, and economy in all the details relating to the keep of the inmates seemed to be the guiding-star of its management. A more false or malicious slander against the inmates could not be imagined than that they were living in a palace, surrounded by all its splendor, its luxuries, its conveniences and its comforts; neither could it be said that by any act or thing, direct or indirect, proximate or remote their consciences were trammelled, their moral status discomposed or liberty of action or *inaction* undisturbed, provided they demanded *nothing*.— The contemplative may suggest the question: "Do the inmates of a poor-house possess a moral as well as an animal nature?"

The report of Dr. Chancellor in regard to the jail is doubtless equally true as in regard to the almshouse, and as topics not coming within the scope of his mission are worthy of note, it is proposed to deal with them. "As the twig is bent the tree is inclined," is a maxim the truth of which is not surpassed by its antiquity. The bending of the human twig is a matter of education, of which the first impressions are made in the family circle and subsequently deepened, perhaps corrected, in the school. As the earliest impressions first give form and direction to character, the lessons taught at home have as a general rule the most power. These should be the most correct, and cannot, except indirectly, be reached by legislation. But if the home circle be not corrupt or vicious, school influences will have full sway in moulding the future man for good or ill. Over the subject of school education the legislature can exercise a powerful influence, and as the prosperity and permanence

of the State mainly depends on the character and condition of its people, every precaution should be taken to so form the character and ameliorate the physical condition of the rising generation as to ensure these objects. What then are requisites to accomplish successfully a good education?—Comfortable and convenient school-houses, with pleasant and healthy surroundings, presided over by humane, pleasant, patient, persevering and competent teachers, are of primary and essential importance.

Four of the public schools of this county are located in the city of Cumberland, and from the number of scholars attending, or who might attend them, should be the best and serve as models for others. The one most esteemed, and perhaps the best of them, known as the Maryland Avenue School, is situated near the south-eastern suburbs of the city. It possesses the advantage of an elevated location, with an abundance of air, sunshine and mud as supplied by the season, and exercise required by its distant location. Its immediate surroundings require but a brief description—a sloping lawn or common abundantly covered by sticky clay and the debris of slate washed down from the hill-side, ornamented with a limited supply of stunted pines, while the ears of the pupils are continually gladdened by the thunders of the neighboring rolling mill or the sharper whistle of the steam engine. The second in importance is on Centre street, in a building erected and for sometime used as a furniture factory, a four-story building, the lower stories occupied for mercantile business and the third alone for school-rooms. The street is narrow, and as a business thoroughfare generally crowded with carts, drays and wagons of all descriptions, while immediately adjoining the building is a large steam furniture factory. There is a great want of light, pure air and ventilation, and room for exercise and recreation, but an abundance of opportunity for perfecting the pupils in the more used if not useful accomplishments of profanity, vulgarity and other vices. A third one is located in the north-eastern suburbs of the city, a one-story brick building, located on a small lot in an open space at the foot

of a hill. The high, close fence which surrounds it, with the water-closet in its immediate rear, are not conducive to good ventilation. In the selection of this site convenience and cleanliness were not considered important items, but good ventilation either impossible or improper. The fourth is located on Green street, in West Cumberland, and on the west side of Will's creek. It stands about 150 feet from the edge of the Potomac river ,and probably less than fifteen feet above its ordinary level, and is overshadowed by a large two-and-a-half story dwelling house with its usual surroundings, including a cow-stable, while on the north and northwest it is overlooked by the courthouse, jail, stables, &c.—In front and on the opposite side of the street are the city water-works and engineer's dwelling. Thus surrounded, the school-house—a one-story brick building—may be described as standing in a hole dug into courthouse hill, which at the rear of the lot is above the level of the school-house roof. There is not one palpable cause of recommendation for the selection of this site, unless it be the facility for drowning the pupils. Take these four school-houses, with all their surroundings, what must be the impressions made on the youthful mind, and what improvements may be reasonably expected in the physical and mental status of the pupils?—A fifth appendage is located in a detached section of South Cumberland. A one-story board shanty, judged by its external appearance, would readily be taken for a green grocery or candy shop for the convenience of some four corners or rural hamlet. It stands on high ground and is centrally situated on the edge of the fair ground or race-course, which furnishes frequent opportunities for *moral* improvement if not mental culture. It may be that other portions of the county and State are less favored in their school system, and probably some of them may be afflicted by a more economical expenditure of the fund, which may account for their being so.

In this connection a brief notice of the city water-works will be appropriate. The pumping apparatus has been described as opposite the Green Street School-house on the edge

of the river and within one hundred and fifty yards of the mouth of Will's creek, running through the centre of the city, the canal dam being about the same distance below this point, renders the river a currentless stream a distance of two miles above the water-works. Will's creek, for a quarter of a mile above, is generally a stagnant pool into which are emptied the washings and other refuse animal and vegetable matter of an extensive tannery. Much nearer still, the gas-works empty their complement of refuse, gas-tar, carbolized lime, &c., into the creek, rendering it at low stages of water a reeking pool, disgusting to sight and smell. A short distance above the water-works is the Potomac coal wharf, where, not unfrequently, during the summer season, are congregated from 150 to 200 boat-horses and mules, the excreta from which, and the boats also, after gliding a short distance along the river bank, finds harborage in the well, is pumped direct into the water mains, distributed throughout the city, furnishing at this period of the year a brownish liquid, a compound of oxygen, hydrogen, carbon and other elements derived from the animal, vegetable and mineral kingdoms requisite to enter into the formation of the human body.—The works were thus located long after the above sources of supply had been erected and operated. If it cannot be said that this location was prompted by human-i-tarian and sanitary motives, it was at least by "economic principles."

The pollution of the water in Will's creek, by tannery refuse, has already been spoken of. Two other streams running the length of Allegany county, from north to south, have extensive tanneries established near the northern side of the county. The refuse from these is regularly discharged into Evitt's creek and Town creek, contaminating them their length to the Potomac. During the summer season fish leave these waters or die therein, horses and other cattle refuse to drink them; they are discolored, unfit for washing purposes, and malignant and fatal epidemics, along at least one of them, have been reasonably attributed to their pollution.

What does this state of things indicate and to what does it point? The necessity—*absolute necessity*—of legislation which shall furnish power and instrumentalities capable of preventing and remedying these evils. A general or State board, with county and municipal, or local boards of health properly constituted, will furnish the best remedy, if competency be made the requisite qualification for the appointments.

A State Board should have power to establish general regulations on all matters affecting health, to devise plans for the ventilation and cleanliness of public buildings and fitness of their surroundings, and the correction of defective plans and surroundings; to supervise the proceedings of the local boards and procure the enforcement of the laws and regulations established for sanitary purposes; to advise the proper steps to be taken for the prevention and spread of malignant, contagious and epidemic diseases, and enforce their execution. The power to remove incompetent and unfaithful incumbents should be placed in their hands, if the appointing power be not conferred on them. When such appointments are not conferred on men merely because they have the name of being *clever*, popular men, tax-payers and zealous partisans, but on men of education, sound judgment and knowledge of the subjects to be dealt with and possessing human sympathy, it may be reasonably expected that disease, depravity and deterioration, mental and physical, will be mitigated, and the power and prosperity of the State be in accordance with her motto of "Crescite et Multiplicamini."

INVESTMENT FOR THE INSANE.

BY AZEL AMES, JR., M. D.

INVESTMENT FOR THE INSANE.

The people of a State as a whole, probably but very vaguely appreciate either the real character or the importance of the work they undertake, when from motives of ordinary public convenience or philanthropy, as is usually the case, they establish institutions for the insane and annually appropriate considerable sums from the public purse for their maintenance. The advantage of having safe and humanely conducted places of confinement for this unfortunate and dangerous class, is of course apparent to all, but the full sanitary, social and economic relations which the insane and their control and treatment sustain to the commonwealth, are as yet too inadequately understood or estimated. It has been amply demonstrated that no other of the dependent classes of society entails so heavy a degree of burden upon the productive industry of the land. It is also certain that no other burdensome class so largely transmits its ill conditions to its posterity. Inasmuch as every producer who is debarred by any cause from securing his own support must become a burden to his fellows, it is clear that when he not only ceases to produce but withdraws others from creative industry to care for him, the loss to the commonality is largely increased. Furthermore, the public suffers not only the loss of the immediate production of these workers, but also that of its normal increase. It is hence plain, that even the ordinary sickness of the population, although temporary, aggregates a heavy annual burden upon the public. When to this is added, as in the case of criminals, the further expense of large and costly provision for safe-keeping, etc., although some return is derived from their labor, it is evident that the burden is still greater upon the community. But when, as with the insane, production absolutely *ceases*, the conditions of safe-keeping must

equal those of the criminal class, and the cost of maintenance and attendance be even greater, it is plain that the public burden reaches the maximum. Indeed, it becomes doubly a burden: first, because of its probable entailment, if there be descendants; and second, because of its hopeless continuance in present sufferers, except as lessened or overcome by wise treatment. In the wisdom of treatment in the broadest sense of the term, resides then our sole hope for both the recovery of the insane and the prevention of hereditary taint in successive generations. To accomplish these happy results, would be of course, to remove in a short time this chief burden from the neck of the commonwealth. Whatever then can promote that wisdom and success of treatment, which alone can secure any approach to, or portion of, this double blessing—emancipation to the sufferers and larger life to the State—is worthy of the most ample consideration and largest liberality. Agencies which operate to prevent and limit the occurrence of insanity in the community are not to be undervalued or neglected, but its urgent presence and imperative proportions will not permit either neglect or narrowness in its management. A wise treatment of the insane has come to mean much more than in former years, and the excellent contrast* recently so ably drawn by Dr. Chas. F. Folsom, Secretary of the State Board of Health of Massachusetts, between the conditions, sanitary, social and moral, which thirty years ago, were thought all sufficient for the surroundings of the insane, and those now deemed requisite, is in itself an index to the vastly better results, alike as to period, percentage and completeness of recovery, which marks the present day. Treatment has indeed come to consist for its chief part in such felicitous adjustment of surroundings, employments and influences as shall, in each case, be indicated. The validity of the trite but ever forceful maxim, *mens sana in corpora sana*, is nowhere more apparent than in the institutions where a sound mind is conspicuous by its absence, and no one is more thoroughly

* Diseases of Mind. Eighth Annual Report Massachusetts State Board of Health.

convinced of the impossibility of securing a normal balance in "a mind diseased" under conditions of bodily unsoundness than the superintendent of an insane asylum. Ample light, air, sunshine, cleanliness, cheery companionship, good food, tasteful dress, music, the song of birds, the face of nature, the bath, the drive, social entertainment, the dance, and abundant sleep, are now reckoned the most potent of the list of remedies in every well-ordered *maison de sante*. If the possession and employment of agents so simple as these can be made effective, as it is proved they can, in restoring large numbers of the insane to useful and happy lives, it will be a short-sighted economy and a poor philanthropy that does not hasten to free the State from its burden, and the afflicted from their woe, by providing abundantly such aids to so beneficent results.

With more than ordinary judgment and good fortune, those intrusted with the location of the State Insane Asylum of Maryland pitched upon the site of Spring Grove, near Catonsville, some six miles west of the city of Baltimore. The grand outlook upon the fine expanse of broken country, and the broad waters of the Patapsco and Chesapeake, was doubtless the chief determiner of the general location, while the fact of its being the highest available point upon the purchase no doubt fixed the present site of the buildings. It is probable, however, that those controlling, in this particular, "builded better than they knew," for an examination of the geological and topographical features of the grounds renders it certain that there is not another spot within the area purchased that would afford a site that could receive sanitary approval. The commendation belonging to the commanding view and sandy sub-stratum of the site cannot be given to the provisions for water-supply and drainage, the character of the soil of the location, and the construction of the institution-buildings themselves. The facilities for water-supply and drainage have never been equal to the dignity or the needs of the institution. The soil of the locality being closely underlaid by a stratum of rotten rock which forms the water-bearing table, is too heavily

"water-logged," and demands efficient under-drainage, both on sanitary and agricultural grounds, while the plan and construction of the buildings, which have been enormously and unnecessarily costly, are not such as present knowledge would approve for the securing of the best results in treatment. It is, however, a source of satisfaction to know that the untoward features, except those of plan and construction in the buildings, are entirely susceptible of remedy, and this at trivial cost. So admirable are the results of fine location and competent management, that the unfortunate effects to be expected from the ill conditions mentioned have thus far been largely escaped. The increase of numbers, the contamination of soil and water, and the demand for the best results, will render it impossible, however, to much longer permit the defects named, or to evade their severe expression. It is, hence, not only a wise but an essential regard for the interests of the asylum and the State that prompts its managers to seek, as they are now doing, ample and satisfactory solution of their sanitary problems.

The small stream which, with the auxiliaries of storage-basins, etc., ingeniously added from time to time, has been the sole source of water-supply at Spring Grove, is capable of furnishing barely enough water, especially in summer, for the needs of the asylum, using no water-closets and with only its present numbers. The considerable increase of inmates contemplated, especially if cottage accommodations are added, as they should and undoubtedly will be, renders it imperative that a source of ample and permanent character should be secured.

The present water needs of the asylum call for about fifteen thousand gallons of water per diem, and in summer time it is difficult to secure the amount, nearly the entire volume of the stream, which skirts the two sides of the grounds, being withdrawn, and a careful economy in the use of water becoming essential. It needs no argument to show that in such an institution such a deficiency of one of the prime necessities and sanitary agents is totally inadmissible. It is further worthy of consideration that the large amount

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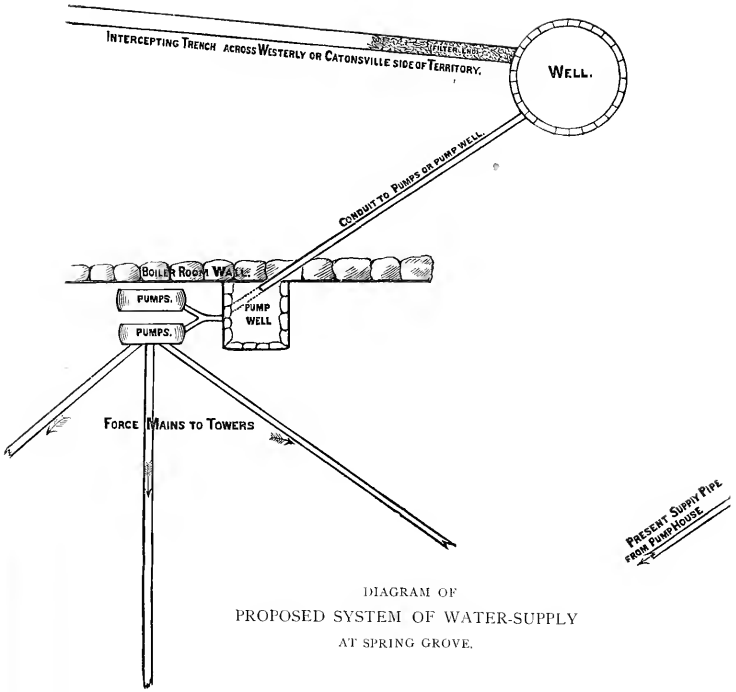

DIAGRAM OF

PROPOSED SYSTEM OF WATER-SUPPLY

AT SPRING GROVE.

of vegetable and alluvial contamination, if nothing worse, to which the water-shed of the stream subjects it, is most unfriendly to its purity, and may even become reponsible for malarial and other ill effects. It is also evident, that if the entire volume of the stream is withdrawn to the uses of the asylum, the waste waters of the establishment, which by any available system of disposal must sooner or later return to the channel of the stream as it leaves the grounds, will find no current to aid its dilution and escape.

It may indeed be stated as a principle of sanitary science, that streams, and notably small ones, should rarely, if ever, be relied upon as sources of domestic water-supply, and Spring Grove is no exception to the rule.

It is plain that to effect approved treatment of the deranged and its wide results, a water-supply of abundance and purity is primarily essential. That it is not possessed at Spring Grove we have seen. It remains to determine whether, and how the deficiency can be supplied.

Examination of the topographical and geological features of the vicinity demonstrates that the higher grounds lying to the west and south of Spring Grove, whose water-bearing table has a general incline toward the asylum, at only a few feet from the surface, are capable of furnishing a very large volume of water daily. This may be readily intercepted and availed of at the asylum location, and when properly filtered will be of desired purity. To construct an intercepting trench, whose lower end shall be a filtering gallery, to gather its waters in a large well and pump them thence to the tower-tanks of the asylum, would be of easy, convenient and inexpensive accomplishment. By such means the full volume of the stream, now diverted to the uses of the institution, will be left free to follow its channel, and may be ponded for ice purposes, and its flow serve to dilute and carry off the affluent waste waters, free from the objections which have called forth judicial interdiction, and of late, prevented drainage into the stream.

The mandate of the court against the use of the stream

for sewer purposes, some time since, necessitated the consideration and establishment of other means of sewage disposal, and led to the introduction of earth-closets for the conservancy of excreta, while the waste waters of bath-tubs, laundry, kitchen, etc., were cared for by a sewer-line discharging upon the grounds. These agencies of disposal have proven not only unsanitary, but inadequate and expensive, and better avenues have been anxiously sought. A change has now become imperative, if considered on sanitary grounds alone, and it seems desirable in any movements in this direction to secure not only the best aids and results, but *all* the results that can be reaped from right methods.

It is not enough that we remove the fæcal matters and waste-waters from the place of their production. To secure against harm and accomplish most good, they must be so disposed of, as, avoiding contamination of soil or water-sources, to contribute to the fertility of the land. At Spring Grove, the needs of the institution, and the good results of light, open-air employment upon certain of the patients, render a considerable cultivation of the soil, wise, profitable and beneficial. To secure the best results in this, and at the same time improve the sanitary condition, an efficient under-draining of the land adjacent to the asylum is indicated, while the excretal-waste should be devoted to its enrichment.

The removal and disposal of the excrements of four hundred people, and of fifteen thousand gallons of water per day, is not an inconsiderable affair. For this offensive total not only requires to be speedily and regularly removed, but when once started it must *go somewhere*, and this "somewhere" does not mean "anywhere," but must be a point and condition which includes convenience, freedom from injury to life, property, health or comfort, small expense and the largest utility.

The soil of the grounds about the asylum is filled with water and cannot well in its present state absorb more, and if it could, would only act injuriously upon health. The

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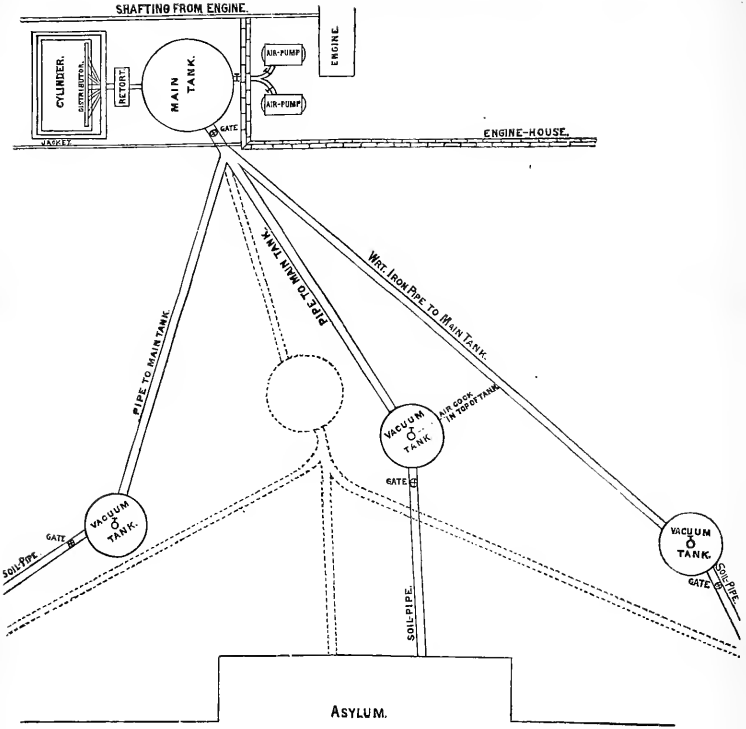


A.

DIAGRAM OF PNEUMATIC SYSTEM

PROPOSED FOR THE REMOVAL OF EXCRETA,

BY 1 OR 3 VACUUM TANKS,

SPRING GROVE.

sewage is refused admission to the stream. Earth-closets can provide only for the excreta, and do this unsatisfactorily. The amount is too large for possible cess-pools and vaults, which too, are expensive, objectionable, and only temporary expedients. It becomes necessary to seek other and peculiar aids to effect the desired end. The steam engine of the institution is of considerably larger power than its uses demand, and greater service could be derived from it at slightly increased cost. The buildings are already well supplied with water-closet conveniences, including soil pipes. The use of these water-closets was necessarily discontinued when the stream was prohibited as an outlet for their waste.—Ample space and favorable location of the engine near the buildings, facilitate the method contemplated, which is modeled upon that of the Dutch-American engineer, Liernur, and may be briefly outlined as follows:

1. The lower ends of the iron soil-pipes of the water-closets are continued outside the buildings, under ground, to one or more sunken, wrought-iron, air-tight tanks, converging at the tank into a single pipe. This pipe is provided with a stop-cock, and the top of the tank with an air-cock.

2. Each tank (if more than one), is in turn connected by an iron, under ground pipe, with another large tank situated near the engine; a similar gate or cock also being provided where the pipe or convergent pipes join the large tank.

3. By means of the engine, air-pumps of sufficient capacity are operated. These create a vacuum in the large tank, and this vacuum is transferred to the smaller.

4. The stop-cock in the convergent house pipes being opened, their contents instantly and with great force rush in under atmospheric pressure to fill the vacuum. As re-vacuum in the larger tank then transfers them thither, by which means all the excretal waste has been removed from the buildings (as often as desired) and conveyed to a large tank at the engine house.

5. We have noticed the need of manure for the agriculture of the institution. The daily gathered contents of the

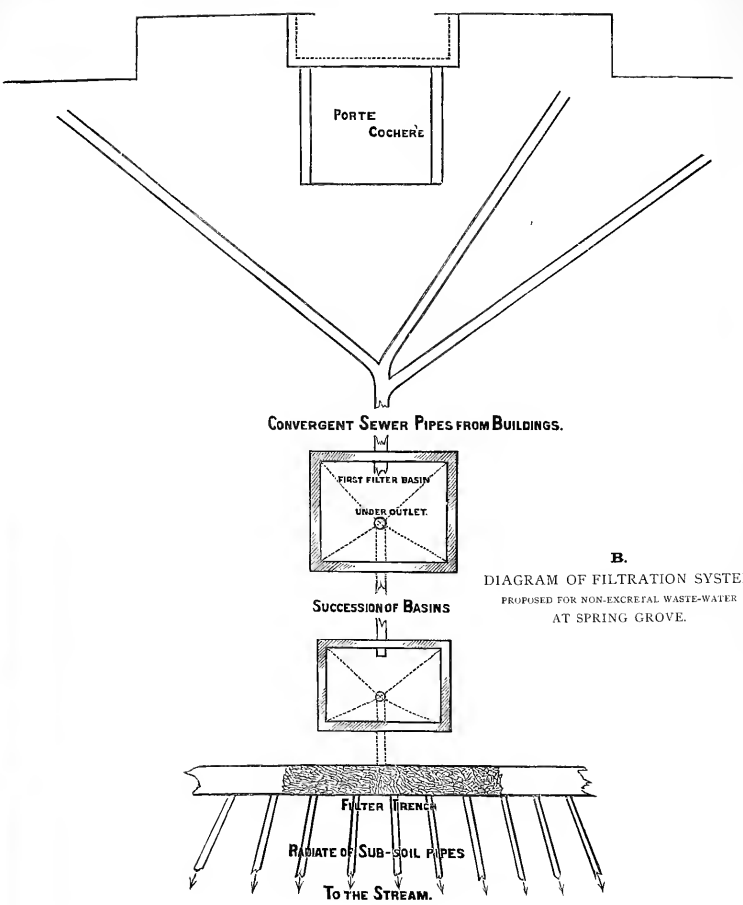
large tank by a series of simple but effective processes, are daily reduced to the form of poudrette ready for application to the soil, and thus the removal and utilization of the excretal waste of the asylum is fully accomplished.

A slight change in the form of the hoppers of the water closets and other simple modifications, enables a very trifling flow of water to entirely cleanse the closet. (Liernur's plan contemplates the avoidance of use of any water.)

The waste water of the establishment resulting from baths, laundry, kitchen, etc., remains only to be disposed of, and, of course, is contaminated only by soapy, greasy, and similar particles.

The very fortunate character and topography of the immediate site of the asylum buildings may become the chief agents in the provision for this waste. The gravelly sand which underlies the structure, continues in a tongue-shaped bed some distance down the rather sharp incline which reaches to the stream before mentioned.

By converging the waste-water pipes of the institution in a common sewer of vitrified pipe, all the waste of this character may be rapidly conveyed to a series of filtering basins, each of which should lie at a slightly lower level than its predecessor. These basins, which should be water-tight, with a pipe leading from the bottom of each to the top of the next lower, being filled with filtering material of different density, will discharge their effluent water from their lowest point, into a filter trench. From the lower border of this trench radiating, porous sub-soil pipes extending a distance of fifty feet may further carry the waters and still terminate some distance from the stream. The upper basins should be filled with clay loam, supplied and removed as often as requisite, at far less trouble and expense than now attends the care of the earth closets. This will engage the greater part of the valuable matter in the sewage and will be devoted to agricultural uses. The lower basins being filled with gravel, sand and charcoal increasing in fineness and compactness with each basin, will successfully remove their quota of the contaminating matters, and the discharge



B.

DIAGRAM OF FILTRATION SYSTEM

PROPOSED FOR NON-EXCRETAL WASTE-WATER

AT SPRING GROVE.

from the lowest will be practically pure. The filter trench will still further eradicate deleterious particles and also oxygenate the fluid, while the porous sub-soil pipes will deliver the percolating waters to the soil which intervenes between them and the stream in so clear a state that after leaching through this they will mingle harmlessly in the full current of the brook.

By these means all of value pertaining to the sewage is utilized and all of harmful tendency removed, while the agencies are simple, inexpensive and safe.

The prime necessities of water-supply and drainage being obtained by the methods outlined, and their powerful aid secured in accomplishing the desired results for those resident, such improvements in the internal features of the institution as may be possible, the warming, lighting ventilating, etc., may receive consideration.

That the conveniences for the disposal of slops, cleansing of bedding and bathing may be much improved without great difficulty or expense appears certain, and although the plan and construction of the buildings are of somewhat inflexible character, advantageous modifications for the promotion of better lighting, warming and ventilation have suggested themselves to the management as possible, and are most desirable. Adaptation of the ample steam-heating facilities to a more efficient ventilation is undoubtedly possible, and requires only an appropriation to be effected.

It would be difficult to improve greatly upon the excellence of the dietary, conduct and influence enjoyed by the inmates at Spring Grove.

The agents enumerated in the beginning of this article as so influential factors in the successful treatment of insanity, have had, with the exception of the water-supply and drainage, a full and most happy recognition and employment at this chief institution of Maryland for the treatment of the insane. With the reasons for the inadequate provision for water and drainage we have become familiar, and are happily able to find ready and non-expensive remedies for.

Given these chief aids to sound physical conditions, and

the associate improvements named, coupled with the grand and elevating outlook of the situation, the rare influences of the management, and the excellent cuisine, and the statisticians of Maryland will not be long in noting a marked change in the number, condition and cost of this ill-starred and burdensome class. The State of Maryland has so long shown so catholic and broad a philanthropy, and has borne so heavy burdens in this direction, that the wish is spontaneous that she may speedily reap of the seed she has sown. It remains for her to add only such further means as may be needful, to secure the broadest physical basis for ampler mental convalescence. Emerson has well said "the first wealth is health." By her generous provision for the enjoyment of every health condition, the State may rightfully expect not only to maintain the productive power of those who possess it, but also to restore to creative industry those whose mental invalidism has made them consumers and not producers of the commonwealth.

The statistics of insanity and its treatment are already very full, and are conclusive to the effect, that largest results are attained where the insane are cared for in asylums and not in alms-houses, or their homes. The per centage of recovery under favorable circumstances with recent cases is astonishingly and most gratifyingly large.*

The return made the State, considering the outlay for the proper treatment of the class, purely as an investment, is equalled by no other, except that for the care of neglected youth. Nothing is more true than the expression of Dr. Wilkins, the Special Commissioner in Lunacy of the State of California, that "any attempt to save money by failing to provide for the insane, is indeed poor economy and worse philanthropy."

Of course the higher the grade of intelligence and capacity in the individual when sane, the greater the loss to the

* Statistics show that insanity is one of the most removable of grave diseases, if the proper measures are used in its early stages. The experience of hospitals shows that from seventy to ninety per cent. may thus be restored to health. The average time required for restoration in hospitals, varies from five and one-half to seven and even eight months.

State by his withdrawal from industry, and the more urgent the desirability of rendering such withdrawal as brief as possible.

When therefore we consider that the higher the cast and finer the fibre of the individual, and his former associations, the greater the necessity for surroundings and influences the most refined, we shall fully agree with the view expressed by a late eminent specialist in lunacy.*

"There is no such thing as a just and proper curative or ameliorating treatment of the insane in cheaply managed institutions; but to do the greatest amount of good to the insane, the mind of the tax-paying community must be trained to understand and admit the necessity of expensive management, and that if it is necessary to have any institutions beyond those receptacles in which the most patients, or rather the most sufferers, can be crowded together at the least charge, it is worth while to establish such as will accomplish all of cure or relief which is practicable."

In recapitulation, it appears that insanity involves and inflicts the heaviest burden upon the State, that under efficient treatment (preferably of the State), it is largely removable, that it well behooves the State to secure this treatment at its best, that liberal expenditure in this direction is wise economy and profitable investment, that whatever contributes to general physical well-being is in the true line of treatment for mental recovery; and finally, that self-interest, common philanthropy and Christian sympathy alike, approve and direct munificent measures to accomplish the ends sought.

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* Dr. Luther V. Bell, Superintendent of McLean Asylum, Mass.

INFANT MORTALITY,

By J. ROBERT WARD, M. D.

Member of the State Board of Health.

INFANT MORTALITY.

Much has been written upon the diseases of infancy and the treatment of these diseases. I propose to call attention to some of the causes that predispose to disease in infancy. All admit that many diseases are hereditary, that is, parents transmit to their offspring a susceptibility to disease in those organs that are constitutionally weak in themselves. Mental and physical idiosyncrasies are noticeable in families for generations. Any organ or faculty at fault in either parent may be, and often is, handed down to the child. If any part of the organism of one parent is at par, or above par, and any part of the organism of the other parent is below par, the two are not blended to form a more perfect being, but the child may inherit the strong or weak peculiarity of either parent; in other words, the parents transmit by heredity their respective peculiarities to their offspring. Such diseases may exist at birth, or they may supervene at a more or less advanced period of existence. It is very important, therefore, that the mother, especially during gestation and the period of lactation, should pay great attention to her mental and physical condition. If she constantly violates the laws of health, during the one period or the other, she imperils the future well-being of her progeny, and may entail upon the child untold evils; for there can be no question that parents do often bequeath their errors to their children. It is not only the duty of both parents to protect and guard, as far as possible, their offspring against the hereditary taints which may exist in their own organization, but also to abstain from an infringement of the laws which govern the animal economy in health, for it is impossible that either parent or child can escape the penalty of that infringement. The adult rarely has impaired digestion from one or two transgressions of these laws, but the nurseling,

from the continued imprudence of the mother, will, it may be slowly and imperceptibly, but nevertheless surely, have its vital powers impaired, and drag out a life of sickness, or succumb to an early death. Milk secreted under mental excitement, irritable temper, great bodily fatigue, irregular hours, indigestible or highly seasoned food, and especially under the constant use of stimulating drinks, is highly prejudicial to infant life; the digestive functions on which the health and growth of the child depends become speedily impaired, the susceptibility to disease increases, and there is less ability to resist its encroachments.

In assuming the important relation of a mother, the woman takes upon herself the most solemn responsibilities of life, and any wilful neglect of the duties appertaining to that holy relation is a sin against the laws of God and nature. Regular habits, self-control, and nutritious, easily digested food, are necessary factors in the life of a mother to insure to the child the *mens sana in corpora sana*. Plain, simple food, regular times for eating and sleeping, exercise in the open air, thorough protection by proper dressing against atmospheric changes, are considerations of the first importance, and should not be lost sight of under any circumstances. Attention to the child's diet, dress, &c., are matters of not less importance. Children should never be given food that requires mastication until they have teeth with which to masticate it.

So long as a child is reared to invite disease, so long must we expect a large infant mortality. Parents who wish to be blessed in their offspring should study by all the means at command to unite in them sound bodies with sound minds. The want of either or both is often the result of ignorance, carelessness, or wilful neglect. The laws of nature are the laws of God, and cannot be broken with impunity.

LIGHT WINES

AND

TABLE-TEA AS MORAL AGENTS,

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LIGHT WINES AND TABLE-TEA AS MORAL AGENTS.

Various causes concur in producing that tendency to excess in drink which is, unfortunately, so prevalent. Among them may, perhaps, be reckoned the laborious and close application, in some form or other, of almost all classes in this country, whether directly engaged in business or not; the want of popular amusements for the people; poverty and distress; the nature of our climate; the scanty supply of cheap fruit (except for a short season in summer), &c., &c. It is by no means meant to be insinuated that industry is an evil, or that popular amusements and the like are unmixed good, but merely, to use a comparison, that the bow, long drawn, is too liable to relax itself violently in the opposite direction. Ardent spirits is thus resorted to as a cheap and ready stimulant, when anything in the shape of indulgence is permitted. A comparatively small quantity of such liquor soon affects the head; perhaps the victim sat down without any intention of indulging to excess, but, self-command being gone, drunkenness, with all its distressing consequences ensues, and, eventually, these coarse stimulants are found to amount to a higher price, in time and money, than even choice wines.

It is manifest that temperance societies, however excellent, do not reach the seat of the evil. Akin to them in principle, a *counteracting* measure may be recommended as apparently of much importance. This measure is the substitution of a light, cheap and pleasant beverage for the intoxicating drinks so common in this country. People of all classes will consume fermented liquor of some kind. Everywhere drinking of one description or another is associated with holiday-making and with relaxation generally. Eating and drinking are both too frequently indulged in to excess. Each admits equally of abuse, as well as every other bounty of Provi-

dence, which may be reckoned either in the class of luxuries or in that of necessaries. The overloading of the stomach, or the intoxication of the brain, are the evils to be deprecated, not the moderately liberal use of food or drink. These are almost as valid reasons against making too hearty a meal on roast beef, as there are against surcharging the brain with wine. "The stomach," says Aretæus, "is the *leader* of pleasure and of pain." In other words, good humor depends, in a great measure, on a good digestion; melancholy is first cousin to dyspepsia; and, as a knock-down blow on the stomach sometimes destroys life at once, so will a number of petty blows, dealt out to it in the shape of too much food, make life short and uncomfortable.

There can be no impropriety in referring on this occasion, to the many passages of Scripture in which the use of wine is spoken of with approbation, while its abuse is reprobated. Our nation having from various causes (the difficulty of procuring pure, cheap wines a principal one), been almost forced into the use of liquors which contain much alcohol, a small quantity of them affects the head, and thus persons become inebriated without being aware of their danger. It is quite unfair to say, that we are resolved to get drunk on something, and to contrast us with other nations in this respect. Livy and other ancient writers describe the Gauls, the ancestors of the modern French, as being much given to intoxication; as eagerly buying "heady liquors" of the Italians at any price within their reach, not excepting that of selling their children, in order to procure the beastly gratification. This was before the vine was cultivated in France. The French of our day, having at hand a light beverage procured from their own vineyards, are, and their nation long has been, eminent for sobriety. The progress of civilization, it is true, must not be lost sight of in the account, yet the uncounteracted tendency of the people is not the less observable. Every one who has spent much time in the wine countries of Europe, has observed that intoxication is very rare there, and at the same time, that the inhabitants consume a good deal of wine. These two conditions are

perfectly compatible. The wine drunk in these districts is indeed "wine"—not "liquid fire."

Since then, it is neither possible nor desirable wholly to dispense with fermented liquors, it becomes an object of no slight importance to place before consumers of all classes, or before as many as possible, a beverage at once palatable, light and cheap—a pleasant but safe stimulant. It may be objected that the natural taste is not inclined to such drink, and that it is altogether ridiculous to think of wine becoming an article for the consumption of working people in this country. To this it may be answered, that there appears to be no reason why a laboring-man should not drink and relish wine as well as his employer. The laborers in wine countries drink nothing else. Should agreeable light wines ever be rendered accessible to our artizans and laborers, they will not be long in preferring them to brandy or whiskey. There certainly is no natural antipathy in mankind to "the juice of the grape," nor sympathy with that obtained from *rye* or *corn*. All such tastes may be both induced and supplanted. Witness the introduction of beer, porter, ginger-ale, &c.

Tea is an instance, too, strikingly in point. No article of consumption was ever more opposed at first, or at any one time seemed less likely to come into general use. Boerhaave, Van Swieten and others, attempted to stem the tide that first set in its favor, but they were incapable of resisting the general impression, and from its exhilarating and gently stimulating qualities it soon became justly acceptable to all classes. The first historical record of the use of tea in Europe, is an act of the English parliament, passed in the year 1660, which enacts, that a duty should be laid on all tea made and sold in coffee-houses; though Lord Arlington ascribes as the exact date of tea-drinking in England, the year 1666, the *annus mirabilis* of Dryden.

Tea has undoubtedly contributed much to keep under intoxication wherever it is used to any extent as a beverage. It not only contributes to the sobriety of a nation, but it imparts all the charms to society which spring from the

enjoyment of conversation, without the excitement which follows upon strong drinks. Raynal has observed that "it has contributed more to the sobriety of the Chinese than the severest laws, the most eloquent harangues of temperance orators, or the best treaties of morality."

Nicolaus Tulpius was about the first medical man who wrote professionally upon tea, and as he was enthusiastic in his admiration of the herb, it could not have been *infused* in a warmer manner. In 1678, Cornelio Bontekoe published a book on the virtues of the tea leaf, which had considerable influence upon its general introduction. He pronounced tea to be the infallible source of health, and if mankind could be induced to drink a sufficient quantity of it, the innumerable "ills that flesh is heir to" would not only be diminished, but entirely unknown. The extravagance of his commendations were severely handled by some of the critics, and he is said to have been rewarded for his judgment by the liberality of that great commercial corporation—the Dutch East India Company. But the most extravagant mention of the tea leaf is found in a quaint advertisement in the latter part of the seventeenth century by "Thomas Garway, tobacconist and seller and retailer of tea and coffee, in Exchange alley, near the Royal Exchange, in London." He says: "The said leaf is of such known virtues, that those very nations, so famous for antiquity, knowledge and wisdom, do frequently sell it among themselves for twice its weight in silver; and the high estimation of the drink made therewith hath occasioned an inquiry into the nature thereof among the most intelligent persons of all nations that have traveled in those parts, who, after exact trial and experience by all ways imaginable, have commended it to the use of their several countries for its virtues and operations." Of the peculiar virtues of this wonderful beverage, this enterprising grocer thus speaks: "It maketh the body active and lusty. It helpeth the headache, giddiness and heaviness thereof. It removeth the obstructions of the spleen. It is very good against the stone and gravel, cleaning the kidneys and ureters, being drank with new honey instead of sugar. It

taketh away the difficulty of breathing, opening obstructions. *It is good against tippling, distillations, and cleareth the sight.* It removeth lassitude, and cleanseth and purifieth acrid humours and a hot liver. It is good against crudities, strengthening the weakness of the stomach, causing good appetite and digestion, and particularly for men of corpulent body and such as are great eaters of flesh. It vanquishes heavy dreams, easeth the frame, and strengtheneth the memory. It overcometh superfluous sleep, and prevents sleepiness in general, a draught of the infusion being taken; so that without trouble whole nights may be spent in study without hurt to the body, in that it moderately healeth and bindeth the mouth of the stomach. It prevents and cures agues, surfeits and fevers by infusing a fit quantity of the leaf, thereby provoking a most gentle vomit and breathing of the pores, and hath been given with wonderful success. It strengtheneth the inward parts and prevents consumption, and powerfully assuageth the pains of the bowels, or griping of the guts, and looseness. It is good for colds, dropsys and scurvys, if properly infused, purging the body by sweat and urine, and expelleth infection. It driveth away all pains of the cholic proceeding from wind, and purgeth safely the gall. And that the virtues and excellencies of this leaf and drink are many and great, is evident and manifest by the high esteem and use of it among the physicians and knowing men of France, Italy, and other parts of christendom; and in England it hath been sold in the leaf for six pounds, and sometimes ten pounds, the pound weight; and in respect of its former scarceness and dearness, it hath been only used as a regalia in high treatments and entertainments, and presents made thereof to princes and grandees, till the year 1657." Upon the same principle on which light wines are recommended, tea will be found useful in preventing or greatly lessening intoxication, and for this purpose cannot be too highly commended as a beverage.

It is well-known that drunkenness, in many of the European countries, is now less common than it was a few centuries ago, and this happy change may be ascribed, in a great

measure, to the substitution of gentle stimulants, such as table-tea and light wines for the gin and "John barley corn" of "merrie England." Why cannot the "Apple Jack" and "Crooked Whiskey" of the United States be also supplanted by less hurtful drinks? If our own grape-growing States cannot manufacture palatable and wholesome wines at reasonable rates, there are numerous districts of Europe both able and willing to supply us with them of low price. These could be sold in this country at a rate not beyond the means of the humblest mechanic or laborer—a rate much below what is now too often bestowed on whiskey and other vile liquors—if the duty imposed by the government was removed.*

Wine merchants, unshackled by the routine and prejudices of trade might, by a personal examination of the wine countries, introduce to their countrymen an excellent and cheap beverage, and, at the same time, open for themselves a lucrative branch of commerce. Bottling would, probably, not be necessary. The wine might be kept for use by the retailer in small casks, and drawn off at once for the consumer like lager beer. It may be said that such wine would not bear the sea voyage; this is altogether untrue, as the experience of private importers for domestic use amply proves. The richer classes also would derive much benefit from this commerce, since light wines for them would thus be obtained cheaper and in greater variety. The present rate of duty is the insurmountable obstacle; and as the subject seems well entitled to the attention of our rulers, government might materially forward the end in view by abolishing the duty on wine altogether; and should the matter be properly followed up by the States interested in the sobriety of their respective populations, there can be no doubt that such action would, ere long, take place. A duty of forty to

*Rate of Duties on Wines.—Still Wines, in casks, forty cents per gallon; Still Wines, in bottles, one dollar and sixty cents per dozen. Quart bottles, or two dozen pint bottles: Sparkling Wines, six dollars per dozen, quarts; three dollars per dozen, pints; one dollar and fifty cents per dozen, half-pints, and bottles three cents each. Five per cent. allowance off *Invoice quantity* for breakage on Sparkling Wine only.

eighty cents per gallon on wine is a great check to its introduction for general consumption. Merchants, under the operation of such a fiscal regulation, naturally enough confine themselves to importing the highest priced and most noted wines.

There is another consideration of no small weight. An extension of the wine trade would lead, inevitably and as a thing of course, to a corresponding introduction of our manufactories into the wine countries. This latter object, confessed by all to be so desirable, would be much more readily attained by taking their commoner wines, than by all the commercial treaties ever devised.

It may be said that malt liquor is as good a beverage as can be used. Taken with meals it is not unsalutary, and this is its proper use; but it is not a holiday drink, and when used on such occasions too often stupifies and becomes the cause of as much intoxication as whiskey itself. Its effects are almost precisely the reverse of those of tea, and this is a pretty good test. In short, in England it has been tried as a preventive of intoxication and found wanting.

It is worth while to quote here the opinions of a man of great practical wisdom in all such matters, the late Thomas Jefferson, ex-president of the United States: "I am persuaded," says Mr. Jefferson, "that were the duty on cheap wines put on the same ratio with the dear, it would wonderfully enlarge the field of those who use wine, to the expulsion of whiskey. The introduction of a very cheap wine (St. George), into my neighborhood, within two years past, has quadrupled in that time the number of those who keep wine, and will ere long increase them ten-fold. This would be a great gain to the treasury, *and to the sobriety of our country.*"—Jefferson's Mem., vol. iv, page 78.

Again he says, "I rejoice as a moralist at the prospect of a reduction of the duties on wine by our national legislature. It is an error to view the tax on that liquor as merely a tax on the rich. It is a prohibition of its use to the middling class of our citizens, and a condemnation of them to the poison of whiskey, which is desolating their houses. *No*

nation is drunken where wine is cheap; and none sober where the dearness of wine substitutes ardent spirits as the common beverage. It is in truth the only antidote to the bane of whiskey. Fix but the duty at the rate of other merchandise, and we can drink wine here as cheap as we do grog; and who will not prefer it? Its extended use will carry health and comfort to a much enlarged circle. Every one in easy circumstances will prefer it to the poison to which they are now driven by their government, and the treasury itself will find that a penny apiece from a dozen, is more than a groat from a single one. This reformation, however, will require time. Our merchants know nothing of the infinite variety of cheap and good wines to be had in Europe; and particularly in France, Italy and the Grecian Islands."—Ibid, p. 320.

Perhaps the government of a country cannot more effectually discharge its high duties than by a careful attention to such matters; since, according to the way in which they are treated, they become the germ of so much good or evil to all classes. Akin to the same subject is that of relaxation or amusements generally for the working class. The abridgement of these things may be carried too far, and probably has been so in this country. We reproach the French and some other nations with their fondness for *spectacula* and diversions. Their meetings, however, are ever accompanied by courteous manners and sobriety, ours too frequently by coarseness and intoxication.